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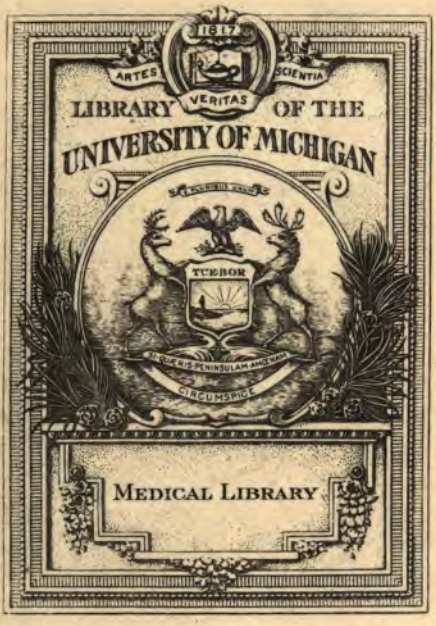

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PAPERS READ AT THE

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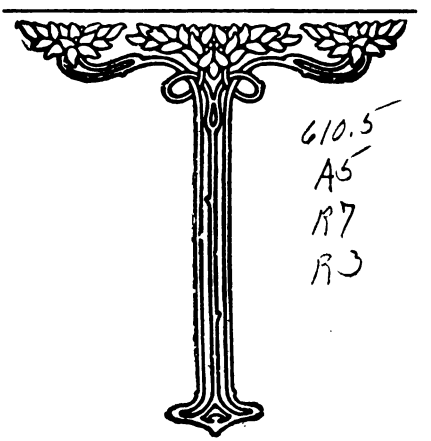

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American Society of Roentgenology

PRESIDENT'S ADDRESS.

BY PERCY BROWN, M. D.

This communication is the partial contribution of a subject dealing with matters with which Roentgenologists come into almost daily contact, and, therefore, possesses for them points of more or less interest. As an abridged contribution, however, it omits the more exhaustive (and exhausting) references which should appear more properly as a published entity. As a backbone for the construction of a somewhat more pretentious endeavor, however, it may serve its purpose.

* * * * *

The practice of Roentgenology as a specialty of medicine and the practice of the law have been brought into contact on many occasions during the past fifteen years. This relationship has been distinctly of two kinds: one, where evidence of disease or injury, obtained by X-rays has been made use of in court, and another where, for alleged malpractice by improper or injudicial use of X-rays, certain medical practitioners have been made the defendants in processes of civil litigation.

Of the medicolegal value of evidence obtained by X-rays more or less has been written, although in a somewhat desultory manner as the subject matter of appendices to text-books upon minor surgery. The modern editions of works upon legal medicine are just beginning to show signs of a recognition of this form in which medicolegal evidence may be pre-

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sented. It is the purpose of this communication to comment upon this phase of the relationship existing between Roentgenology and the law.

Of cases where legal proceedings have been engendered by the alleged misuse of X-rays, either as a diagnostic or therapeutic agent, it is a satisfaction to be able to say that occurrences are far fewer than formerly. This is no doubt due to the fact that, through discouragement of one sort or another, the clinical application of X-rays is being relinquished by many unqualified and incompetent persons. The technical records of these cases differ but slightly from those where civil malpractice is charged through any other mediumship and they can not be of any especial interest when an attempt is made, as on this occasion, to consider the development, and, therefore, the broadening, of the legal attitude towards X-rays as a means of obtaining and presenting evidence.

The earliest attempts, apparently, to introduce into court the results of examinations by X-rays, consisted of the presentation, for examination by the jury, of solar prints upon paper, from the original diagnostic plates. This procedure was ill advised—at least, it was an unfortunate thing to have evidence presented by a means so inaccurate, for prints were more or less naturally accepted by many courts as *photographs* to come under the head of documentary evidence, and considered quite as any record produced with the photographic lens by solar illumination.

In other words, the position and standing of the results of clinical examinations by X-rays as evidence suffered, and suffers today, by faulty presentation at the start and the courts, of course, accept them as they are offered.

This early attitude of the courts toward the *character* of evidence of this sort is shown in nearly every Supreme Court decision upon the subject to be obtained from the reports. One or two citations will suffice:

In the much cited case of Miller v. Minturn, 73 Arkansas 183, the report is as follows:

"In an action against a physician for negligence in setting a fractured ankle, X-ray photographs of the injured member

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are admissible, with a proper caution against their being treated as infallible."

In 7 Ohio Nisi Prius Reports 472 the opinion is as follows in the case of Tish v. Welker et. al.:

"Photographs by the Roentgen or X-ray processes, showing the shape and size of a broken bone at different stages of its treatment, are competent evidence in a malpractice case."

Again, in Dean v. Wabash R. R. Co. 129 S. W. 953, it was handed down that "Where an X-ray photograph was taken of plaintiff's femur and was properly proved to have been correct, it was admissible as a memorandum to assist an expert in testifying as to plaintiff's condition and to illustrate scientific explanation of the witness."

Again, in Bruce v. Beall 99 Tenn. 303:

"An X-ray photograph, showing the overlapping bones of one of the legs of the plaintiff, broken by an injury for which suit is brought, taken by a physician and surgeon familiar with fractures and the process of taking such photographs, who testifies that it accurately represents the condition of the leg, is admissible in evidence."

Once again, in the case of Haywood v. Dering Coal Company, 145 Illinois Appellate Reports 506:

"Upon a proper foundation being made, X-ray photographs are competent to show the extent of an injury."

These citations and many others indicate fairly well the attitude of Supreme Courts upon the status, per se, of the X-rays as evidence in court, whenever the matter has been brought forward for their decisions. It is not within the bounds of possibility, however, to expect all at once, or even within a period of ten years, a full comprehension of the technical aspects of this form of diagnosis in others than those who pursue it as a specialty of medicine. It will be seen in almost every citation obtained from the records that evidence produced by means of the Roentgen rays is regarded much in the same light as a solar photograph would be. Consequently, it is considered of a nature documentary and certain lawyers have even gone so far as to attempt on this ground to have it

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introduced as secondary evidence. To illustrate this point, let the following case be cited (Houston & Texas Central Railroad Company v. Shapard Tex. Civ. App. 1909; also cited in 118 S. W. 596):

"The scientific principles relating to photography, and mechanical and chemical processes employed and the general accuracy of the results, are known to the courts. The accuracy of a properly taken X-ray *photograph* of the *bones* of a living body will be judicially known."

How far short of the mark this falls! It assumes that Roentgenology, as known then or even as known today, is photography, of which the appearance and process are, of course, well known to many individuals in all walks of life.

A perusal of early judicial opinions, thus recorded upon the status of the X-rays in court, only tends to stimulate, through the very adversity of this opinion, the Roentgenologist having any belief in the dignity of his position in medicine. It stimulates him to set up for himself, and for his fellows, certain standards to which should be lifted, not only his conduct in court, but the evidence which he offers.

The standards which at first occur to any one with even the smallest court experience may be embraced under two simple groups:

Group one: The qualification of the witness.

Group two: The quality of his testimony.

Many lawyers will say that the above two groups go hand in hand—that the degree of one directly influences the degree of the other. It is not unsafe to say that this is not absolutely so—that many instances are on record where the witness, properly qualified under the law as a medical expert has been but potter's clay when it came to giving an expert opinion upon a matter dealing with Roentgen rays.

Conversely, influences of distinct value to the good conduct of a case have been offered, in matters connected with X-rays, by witnesses who would have been quite unable to qualify as medical experts. The very fact that this question allows of a direct and converse interpretation suggests an element of confusion.

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Again, to exemplify the two situations:

Since they can duly qualify under the law as medical experts, many admirable physicians or surgeons believe themselves able to give expert opinion upon matters connected with the interpretation of X-ray records in court, and are on record as saying so. They bask in this belief because, luckily for them, they are very seldom asked to pass upon questions dealing with else than the position of fracture-fragments or the presence or absence of callus. However, let them under oath essay the not infrequent Roentgenological problem (and, by the way, a possible very pretty legal problem as well) of the differential diagnosis between a tibial periostitis sustained traumatically in a railroad collision and the same lesion in the same place contracted as the result of a social misdemeanor, and their qualifications as medical experts may avail them little.

In short, the qualifications of the Roentgen worker as a medical expert witness should be themselves qualified. The court should not be content to accept him as a medical practitioner (which he invariably should be) alone, but his recognition in his own community and in a recognized society of his colleagues should be ascertained and testified to. Let us then set up for ourselves as our first standard

PROPER PROFESSIONAL QUALIFICATIONS.

Fortunately we shall find ourselves already given much assistance towards this attainment by the attitude of the law, as recorded in many instances. Lawson: "Expert Opinion and Evidence," Rule 31, 184, Sec. III:

"It is not to be understood, however, that every photograph offered as taken by the cathode or X-ray process determined by the trial judge, depends upon the science, skill, experience and intelligence of the party taking the pictures and testifying with regard to it, and, lacking these important qualifications, it should not be admitted; and again, even when it is not conclusive upon the triore of fact, it is to be weighed like other competent evidence."

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The Roentgenologist as a medical expert in court holds untold power to effect a good or bad impression by his manner of conduct. He can also by his testimony very easily alter many aspects of the case. An absolute neutral attitude, therefore, should ever place him absolutely beyond reproach. He may alone know that a little distortion is necessary completely to change the aspect of a broken bone. He may alone know that bone repair exists where apparently it does not. He may have his cross-examiner, and in fact every one connected with the case, almost at his mercy. A cross-examination based upon citations from old authorities has no terrors for him, for there are few "old authorities" in the usually accepted sense, to be consulted in our young specialty. Roentgen experts are seldom brought into the case in opposition to him. Consequently, just because he is armed with advantages far beyond those possessed by the average expert, he can well raise as his second standard

PROPER PROFESSIONAL CONDUCT.

It needs no citations from the authorities and records to substantiate the necessity and extreme desirability of such a position. Every medical school graduate, if he has forgotten all else of his course in legal medicine, should remember the axiom taught him as to his conduct on the witness stand. The same axioms apply largely to his general conduct as a gentleman, among gentlemen. This applies more directly to the Roentgenologist than to any other, on account of the fact, as has been said, of the great advantage he possesses by the incontrovertible value of his testimony.

The very fact that he is empowered by means of his art to produce evidence from the realms of the unseen, which is ordinarily denied to the human eye, adds additional dignity to that evidence and to the testimony of the one producing it in court. Since this is so, he can never over-exert himself in the preparation of such evidence as he may have to present. It often happens that there is no suspicion of possible litigation at the time he makes his original examination. This fact

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makes it all the more necessary for him to apply to himself one of the fundamental essentials of the true Roentgenologist: namely, *attention to detail.* Thus, whatever may be the ultimate outcome of any case, the careful worker shall never be caught unawares whenever his services are sought by the courts. It is often adjudged by the lay mind that many and repeated clinical examinations, in medicine at least, are indications of personal weakness and lack of skill in the pursuance of one's work. This is an attitude with which the Roentgenologist has often to contend. He may be, and has been, derided and his efficiency questioned by cross-examiners upon this very point. It does not take even a jury long to understand, however, that repetitions in applied endeavor more often indicate a laudable tendency to infinite pains and care. The employment of pains and care, however, the Roentgenologist must be careful not to over do. The evidence of his zeal may be misappropriated. This caution applies especially to the marking of his records before the case comes up for trial. Beyond a general mark for purposes of identification, such as his own case number or plate number, it were better that all records be marked in the presence of the court at the time they are admitted as evidence. The possible consequences of confusion as to identification marks may be shown in the following well-known case, which is given somewhat in detail on account of its importance in this connection (DeForge v. N. Y., N. H. & H. R. R. Co. 178 Mass. 59):

"The remaining question relates to the exclusion of evidence offered by the defendant. As a result of the accident the plaintiff's left foot was injured and the principal inquiry at the trial was as to the extent of the injury. The plaintiff put in evidence X-ray pictures of the plaintiff's two feet, printed from a glass plate. Each of the pictures was marked under the toes of each foot, 'left' and 'right' respectively, both words being in lead pencil. One of the plaintiff's witnesses explained that the representation of the foot with the word 'left' below it, was the left foot and represented the injured foot, and the other marked 'right' was the right foot. He then testified that there had been a dislocation of the bones upward

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and that an enlargement of the bone of the foot marked 'left' in the picture was, in his opinion, the result of fracture, and that the man would always have a weak foot and would not be able to perform the duties of a freight brakeman. On cross examination he testified that, leaving out the question of fracture, there was no reason why the plaintiff could not have a perfectly useful foot; and that, leaving the picture out, there was nothing to the eye to disclose any fracture; although he has suspicions as to a fracture.

"The defendant contended and offered to show that the X-ray placed the right foot upon the right side of the plate, and the left foot upon the left side of the plate, and that in printing sensitized paper the objects would be reversed; and that, as a matter of fact, the pictures showing an enlargement were pictures of the right foot instead of the left. This evidence was excluded. Immediately before this the defendant had offered the glass plate from which the plaintiff's pictures were taken, and this was excluded. Subsequently other pictures printed from the same plate were offered in evidence and were excluded.

"No reason appears in the exceptions why the evidence offered by the defendant was excluded; and we can see no reason why the plate from which the pictures put in evidence by the plaintiff were printed, should not have been admitted. It was produced by a photographer who made the pictures. The ground urged by the plaintiff against its admission was that it had on it the letters R and L which had been put on since the pictures put in evidence by the plaintiff had been printed. These letters did not in any way obscure the portion of the left foot in controversy, and were certainly no more objectionable than the letters added in pencil to the plaintiff's pictures.

"It is further contended by the plaintiff that there was some doubt as to the manner in which the plate was made, and that the judge might have excluded it for that reason. We see nothing in the exceptions to substantiate this claim. If it were true, then the plaintiff's pictures should not have been admitted.

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"It is entirely clear from the testimony that the picture on the glass plate was not taken by a lens, but by an X-ray machine; and that it was the impression of a shadow, not the reflection of an object, the plate being below the feet, and the light above them. When pictures were printed from the plate, the position of the feet would be reversed; and this would have been demonstrated had the plate and the pictures taken by the defendant been admitted. The plaintiff assumed from his marking on the pictures admitted that the feet, as represented on the plate, were reversed, which is not in accordance with the testimony given by his own witness as to the manner in which the impressions on the plate were produced.

"Lastly, it is asserted that the judge might have excluded in his discretion the plate and the pictures offered by the defendant. The rule is thus stated by Chief Justice Gray in Blair v. Pelham 118 Mass. 420: 'A plan or picture, whether made by the hand of man or by photography, is admissible in evidence, if verified by proof that it is a true representation of the subject, to assist the jury in u[redacted]anding the case. * * * Whether it is sufficiently v[redacted]is a preliminary question of fact to be decided by the judge presiding at the trial, and not open to exceptions.' It is therefore in the matter of verification or authentication that the judge has discretion. But here, there is no question of this sort. The plaintiff had put in two pictures printed from the glass plate. The defendant then offered the plate together with two other pictures made from the same plate; and the evidence of verification was stronger in the case of the defendant's pictures than in the case of the plaintiff's. The photographer who took the plaintiff's pictures testified that he did not know much about the X-ray; while the person who took the picture for the defendant was a physician of high-standing who had taken, as he testified, in the neighborhood of a hundred X-ray pictures and had seen the majority of them developed. On this evidence we do not deem it possible that the judge could have excluded the plate or the pictures on the ground that they were not duly verified. While a picture produced by an X-ray can not be verified as a true representation of the subject, in

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the same way that a picture made by a camera can be, yet it should be admitted, if properly taken. * * * We are of the opinion that the rights of the defendant in this case were violated and that the glass plate, the pictures taken by the defendant, and the evidence offered by the defendant and excluded, should have been admitted. It is clearly competent for the defendant to introduce evidence to show that the plaintiff's pictures showing an enlargement of one of the feet and from which a witness for the plaintiff discovered a fracture, did not represent the left foot, but the right, and for this purpose to show the difference between an ordinary photograph and one taken by an X-ray."

It is naturally the contention of every opposing lawyer, now that the standing of the Roentgen rays as a means of producing evidence is well established in the courts of all states, to try by every known means to procure their rejection by the court on technical grounds. Any objection or exception thus taken on general grounds is usually at once defeated and citations are very properly given by the court in stating its reason for admitting X-ray plates. In the case of Mauch v. the City of Hartford, cited in 112 Wisc. 40 and also in 87 N. W. 816, the Supreme Court, with reference to an exception taken by the opposition upon the admission of X-ray records on general grounds, says:

"It is the duty of courts to use every means for discovering the truth reasonably calculated to aid in that regard. In the performance of that duty every new discovery, when it shall have passed beyond the experimental state, must necessarily be treated as a new aid in the administration of justice in the field covered by it. In that view, courts have shown no hesitation in proper cases in availing themselves of the art of photography by the X-ray process."

A very common exception taken in such cases is the contention that there is no means actually of proving that such an injury exists, although it is seen to exist and seems to exist by means of the record made by X-rays. These contentions seemingly are weak in that they fail to recognize the now generally accepted fact that by X-rays, there is revealed as

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true an impression of the condition existing, as there would be if the condition were impressed directly upon the human retina through the sense of sight. This is suggested in the following decision:

"There was no error in the matter of the admission in evidence of the photographs of the bones of appellee's leg taken with an X-ray instrument in connection with the testimony of Dr. B., as to the character and use of the instrument and the manner in which the photographs were taken. The burden of the appellant's objection seems to be that, without cutting away the intervening flesh, skin, etc., it was impossible to tell whether these photographs correctly represented the condition of the injured bones. It would be strange if, in the trial of cases in courts, use could not be made of facts elicited by means of a process, the usefulness and the absolute accuracy of which has been so completely demonstrated as have been photographic views of the bones of a living body by means of the X-ray. When properly taken, as these views were shown to have been, it is a matter of such common knowledge that they accurately represent what they purport to show, that even the courts may take cognizance of the fact. There was no error in the admission of the photographic views and the testimony of the expert medical witness in connection therewith. It was shown that the instrument used was a correct instrument of the kind and had been frequently used by the witness. The fifth, sixth and seventh assignments of error presenting appellant's objections to the introduction of the pictures and the testimony of the physicians based thereon as to the condition of the injured bones are overruled."

It may be likewise argued that evidence by X-rays be ruled out on the ground that the examination was made at a period of time too remote from the time of injury to make the evidence competent. This has many times occurred, especially where a case in course of trial has happened to have passed from the hands of one attorney into those of another. The new counsel has recognized the possible value of evidence by X-rays in the case, where the former either forgot such a possibility or disregarded it. The Supreme Court, in the case of

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Bonnet v. Foote (107 Pac. 252 and also in 47 Colorado 282) says:

"A skiagraph taken five years after an injury was not for that reason inadmissible, the delay merely going to its weight."

In this connection the suggestion might not improperly be offered by the lay observer, who, however, has knowledge of the relationship between medical cause and effect, that the weight of such evidence may well be *increased* in direct proportion to the lapse of time between injury and examination! The remote effects of bodily injury are certainly more seriously to be regarded than the immediate.

The Roentgenologist may also have his evidence challenged on the ground that its presentation to the jury may tend to excite sympathy or prejudice. On this point, Wharton and Stillé, in section 564 of their work on Legal Medicine, cite from the decisions in Orscheln v. Scott (90 Mo. App. 352 and State v. Wieners 66 Mo. 13):

"* * * Such exhibitions are not subject to objections that they tend to excite sympathy or prejudice."

In his defense of his third standard, to wit:

PROPER EVIDENCE, PROPERLY PRESENTED

the Roentgen expert has all these matters to contend with. His first standard, above stated, and his last standard, just mentioned, are so closely interwoven, that the latter can not stand alone without support from the former. In other words, unless his evidence can rest upon the frame-work of his professional qualifications as an expert (and qualifications much more drastic than those required by law), it will surely lose weight, if indeed it is not quite discredited through its own incompetence. That this will be so, has often been shown in the court records. To quote the Supreme Court of Vermont in Sias v. Consolidated Lighting Co. (73 Vt. 35):

"Where, in an action by a servant for personal injuries, witness had testified that he took X-ray photographs of the injured joint, it was error to allow him to explain that, the reason there were no light lines running across the foot of the perpendicular bones of the leg, was because there was a

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fracture close to the ankle joint, which afterward filled with *cartilage*, though he afterward testified that in photographing ankle joints in their natural condition, the light lines appeared and that he had taken some 1600 photographs in different parts of the body, as such testimony did not qualify him as an expert to state the conclusions."

Close examination of the remainder of the record of this decision fails to reveal any medical education or standing possessed by the individual brought forward to testify, as above stated.

Let us jump to the other extremity of our country, and we shall find the same judicial insistence upon the proper qualification of the witness as an expert and his rights as such. In Miller v. Dumon (24 Washington 648, also 64 Pac. 814) the court finds:

"In the progress of the trial, one, Dr. Kibbe, was examined as a witness and was permitted over the appellant's objection to exhibit to the jury an X-ray negative taken by himself of the respondent's injured limb and to testify that, in his opinion, based upon his examination made in this manner, the tibia of the leg had been fractured at a place a little below the knee joint. The negative was also permitted to go to the jury. The appellant assigns error on the ruling of the court permitting the witness to testify as to his opinion, and permitting the negative to be introduced in evidence. It is argued that the witness instead of being permitted to express his opinion that the bone of the leg had been fractured, should have been confined to explaining what appearances upon the negative indicated a fracture, and leaving it for the jury to determine from the negative whether these appearances were there or not. Counsel, it would seem, has overlooked the fact that the witness qualified as a physician and surgeon, not only familiar with fractures, but with the X-ray process of determining whether a fracture had ever existed. As an expert he was as much qualified to express his opinion from an examination made in this way, as were the experts called by the appellant, who made their examinations by means more commonly used by the medical profession. The method of exami-

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nation did not affect the competency of his testimony. How much it affected its weight, was entirely a question for the jury. Nor do we think the introduction of the negative itself was objectionable. The process by which it was obtained was fully explained to the court. * * * Photographs taken by the common process are generally held admissible as evidence and there would seem to be no reason for making a distinction between an X-ray and a common photograph; that is, either is admissible as evidence when verified by proof that it is a true representation of an object which is the subject of inquiry."

As Roentgenologists we would naturally like to see all evidence bearing on physical examinations by X-rays exalted from the level of secondary documentary evidence to the plane of primary evidence of opinion. We would like to see ourselves removed from the gamut of the photographer on the witness stand, our statements received with disdain by our legal brethren, to that class of conservative rational expert witnesses whose statements suggest safety and sanity, if nothing more.

This *will* be accomplished, just as soon as the legalized practice of Roentgenology is given over to intelligent, cool-headed and deep-thinking medical men, and taken from the hands of whirling dervishes! Our evidence in the stand will become exalted in court, just as soon as we choose to exalt it. Our testimony will be accorded the dignity it deserves, just as soon as we, as witnesses, become dignified. When this happens, our statements will be taken as carefully thought-out expressions of opinion without the necessity of secondary documentary evidence. The more one peruses the law reports for references to the use of X-rays in legal matters (and they are by no means few, as has been seen above), the more one realizes that the general judicial attitude toward our field of medical endeavor is not only a favorable one, but an interested one. It is our set task to expand this interest into enthusiasm. Lawyers like facts, and if the Roentgenologist deals not with facts, he deals with nothing. Let him, who for a moment doubts the true attitude of the law to our science, read the

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decision handed own in the District Court of Colorado in the case of Smith v. Grant, and reported in 29 Chicago Legal News 145. It is a classic:

"These photographs are offered in evidence to show the present condition of the head and neck of the femur bone, which is entirely hidden from the eye of the surgeon. Nature has surrounded it with tissues for its protection and there it lies hidden; it can not by any possibility be removed or exposed that it may be compared with its shadow as developed by this new scientific process. In addition to these exhibits in evidence, we have nothing to do or say as to what they purport to represent; that will without doubt be explained by eminent surgeons. These exhibits are only pictures or maps to be used in explanation of a present condition and, therefore, are secondary evidence and not primary. They may be shown to the jury as illustrating or making clear the testimony of experts. * * * During the last decade at least no science has made such mighty strides forward as surgery. It is eminently a scientific profession, alike interesting to the learned and the unlearned. It makes use of all science and learning. It is of inestimable value to mankind. It must not be said of the law that it is wed to precedent; that it will not lend a helping hand. Rather let the courts throw open the door to all well-considered scientific discoveries. Modern science has made it possible to look beneath the tissue of the human body and has aided the surgeon in telling of the human mysteries. We believe it to be our duty in this case to be the first, if you please, so to consider it, to admit in evidence a process known and acknowledged as a determinate science. The exhibits are admitted as evidence."

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THE ROENTGEN RAY IN HYPERTROPHIED PROSTATE.

A THERAPEUTIC STUDY.

BY JAMES W. HUNTER, JR., M. D., NORFOLK, VA.

A casual glance at the enormous number of articles upon the treatment of hypertrophied prostate as recorded in the index Medicus or in the catalogue of the library of the Surgeon General of the United States Army, would lead one almost invariably to the conclusion that this was a disease amenable to a great diversity of procedures and consequently likely to give the attending physician but little trouble. Upon further investigation, however (especially when one has had some experience of his own), we must conclude that here, as elsewhere when a great number of treatments are suggested, few of them are of any value and none specific.

The ideal treatment in cases of hypertrophied prostate is, of course, its radical removal. In the hands of skillful operators the results are excellent. Thus Judd (Journal of the American Medical Association, 1911, Vol. LVIII, P. 458) reports a mortality of only 29 (from kidney lesions within two months) out of a total of 542 cases operated on by the Mayos. Young's (Journal of the American Medical Association, 1910, Vol. LIV, P. 790) statistics are somewhat better, a mortality of 13 in 400 cases. "During a period of two years and eight months," he writes, "128 consecutive cases were subjected to the operation of consecutive perineal prostatectomy without a single fatal result, all of the patients returning to their homes. Forty-three of these cases were over seventy years of age and two were over eighty years of age." Such are the results with selected cases in the hands of our greatest operators. In the ordinary run of cases, however, subjected to the general surgeon, we must expect, as in any other major operation upon

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elderly people, a high mortality. At least this is the experience with most of my surgical friends. And what of the inoperable cases? What of those with cardiac, vesical and renal lesions?

In many cases even when the patient has been subjected to a prostatectomy, nothing has been gained. Thus, to quote Judd (see above): "The functional results, referring to the power to retain the urine after operation, are almost as important as the question of mortality. We rarely see patients with complete incontinence and consequently obliged to wear a urinal, who can be kept at all comfortable, and many times they are much worse off than they were previous to the operation." And again, "If a catheter be introduced into the bladder and but a light amount of residual urine is found in a case having marked secondary symptoms without great difficulty in voiding, we may expect little or no benefit from a prostatectomy, no matter how great the tumor's size. * * * We would operate with great risk." This is the testimony of one of our greatest surgeons. If now we add the fact that 34 per cent of men over sixty years of age are affected with genuine hypertrophy of the prostate (Thompson and Guyon, quoted by Judd) and that an exceedingly large number of prostatetics are unfavorable for operation we must see that in the great majority of cases other means must be tried.

With this in view many of our genito-urinary surgeons have sought means less violent or more or less indirect. Bottini attempted to construct a new canal through the prostate by means of the electric cautery. His operation has, however, been only a partial success. The danger of infection and the formation of scar tissue must be reckoned with. Upon the assumption that a double öophrectomy will cause a diminution in the size of a fibroid uterus, the mutilating operation of castration came into favor. But again success was only partial; likewise the operation of vasectomy. Nor has medical treatment been of any avail. However valuable as an adjuvant, it cannot remove the cause. In most cases, therefore, prostatic massage through the rectum and the intelligent use of the catheter would seem to be the only remedies.

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But this same massage is useless if employed upon a sclerosed prostate. At best it can only express the secretion from the gland. The kindly forces of nature may then bring about a reduction in size, but it is more probable that the gland will again expand. What we must seek is at the same time to change the internal structure. We must limit the growth of the soft prostates; we must soften and reduce the harder ones. Such is the task before us. I know of no agent capable of this save the Roentgen ray, and, though it has its limitations, as we shall presently see, it will be my purpose to discuss the possibilities of the new treatment.

If we review the histology of the prostate (see Böhn-Davidoff-Huber, Text-book of Histology, 1900, PP. 330-332), we shall find that unlike most glands it is surrounded by a capsule made up of non-striated muscle fibres and yellow elastic fibres. Processes extend inward, thereby breaking up the structure into a number of alveoli. These latter are lined with a simple columnar epithelium containing within the lumen several bodies known as corpora amylacea. When hypertrophy occurs (see Ziegler, Text-book of Special Pathology, American edition, PP. 104-105) we are dealing essentially with a hyperplasia, chiefly in the epithelial elements, these latter being thrown into folds. Now in order to accommodate this increase in glandular area, we must also get an increase in the muscle and fibrous tissue. In other words, we are dealing with a condition similar to that found in exophthalmic goitre. And, as the Roentgen ray acts mostly upon the epithelium, and especially upon that composing glandular tissue, we may expect a rapid decrease in size. But, on the other hand, if there has been a great increase in the muscle or fibrous tissue, the decrease will be but slight. Hence it is that the first and second degrees of prostatic hypertrophy are most amenable to treatment. If we could only know the microscopic appearance of the gland with which we were dealing our statistics could through a careful selection of cases equal those of any operation.

This line of reasoning has been amply borne out by clinical observation. Thus Robarts, of St. Louis (American

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Journal of Dermatology and Genito-urinary Diseases, Vol. VL, P. 93), reported in 1902 an improvement in three cases of enlarged prostate treated by the Roentgen ray, though he was unable to obtain a radical cure. He came upon this form of treatment by accident and claimed priority. Gautier, of Paris (Giornale di Electriata Medica, Napoli, 1902, i i i P. 224, and Brazil Medico, Rio de Janiero, 1902 XVI, 403), during the same year reported a great relief of the symptoms in these cases with a diminution of the residual urine. "Decided results," he says, "were obtained in from four to eight sittings. Three years later in 1905, Carabelli and Luraschi (Gazetta degl Ospedali Milano, abstracted in the Journal of the American Association, Sept. 2nd, 1905), after waiting a year, reported two cases, one sixty-six and the other sixty-five, completely cured. In the latter the prostate was greatly enlarged and hard and the residual urine was reduced from 200 CC. to 10 CC. While Rollins, of Boston (Boston Medical Journal, 1905, Vol. CLIII, P. 153), though reporting no cases, suggested a new technique.

Again in 1905 Moszkowicz (Münch. Med. Wochen, 1905, Vol. LIII, P. 730) reported three cases, aged respectively sixty-one, sixty-six and seventy-seven years, all of whom had to lead a catheter life. On the day following the first sitting the patient could urinate without the use of the catheter; a week later the prostate was softer and continued to decrease in size. But in the first case seventeen days after the last irradiation there was an epididymitis; in the second, fourteen days after, the symptoms of a hemorrhagic cystitis. Consequently, the third case was treated only once. A little later, he in company with Dragmann (Münch. Med. Wochen, Vol.II, 1390) gives his experience with six cases, ranging from sixty-one to seventy-four, in which five were relieved, and of these four were symptomatically cured.

Tansard and Fleig (Annals des Maladies des organs Génito-Urinairs, Paris, 1906, XXIV, P. 184, and Fleig, Revue Pratique des Maladies des Organs Génito-Urinaires, 1907-8, IV. P. 203) treated two cases. The first was that of a man aged sixty-three years who had had two attacks of gonorrhea and

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one of double orchitis. He was treated nine months and dismissed as cured. The second case, though irradiated only four times, was greatly benefited, though a malignant invasion of the intestinal tract prevented further sittings. Lasseuer of Lausanne (Archives D' Electricité Medicale experimentale at Clinque, Bordeaux, 1907, XV, P. 371) cites these cases aged sixty-six, sixty-eight and seventy-two who were so greatly benefited that they considered themselves cured, though he had regarded one of them as unfavorable for radiotherapy and advised an operation, which was refused. Tousey (Medical Electricity and Roentgen rays, 1910, P. 999) reports that "he has treated several cases and in some a few X-ray treatments have produced a marked reduction in the amount of residual urine and a return of the ability to urinate without a catheter." In a later communication (American Quarterly of Roentgenology, Vol. III, P. 143) he reports one case treated by the Roentgen ray in conjunction with the high frequency electrode as practically cured. To these Schlagintweit (Ztsch. F. Urologie, Band 1, No. 51-33) adds that he has irradiated 53 cases, of whom 30 received more than three sittings. All of these 30, he says, were greatly improved, although in his experience the residual urine did not decrease in proportion to the other improvement.

On the other hand, Bangs (Medical Record, 1907, LXXI, P. 902) doubts the efficiency of the Roentgen ray treatment as applied to enlarged prostate and advises the profession to be skeptical of the so-called cures of this condition. He cites a case in which the patient after treatment with the Roentgen ray considered himself as cured. But a year later his symptoms recurred and, although he was again treated, he experienced little if any relief. Bangs saw him a little later. The examination at that time showed an enlarged prostate. Bangs doubts if any real good was accomplished by the Roentgen ray and thinks that the improvement in the patient was due to the improved hygiene with which he has been surrounded, a Mediterranean voyage, a warmer climate, etc. Consequently he advises prostatectomy as the only rational method of dealing with these cases.

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My own experience has been as follows:

CASE I—Mr. G., a carpenter, aged eighty years, a widower, suffered with a hyperacidity of the stomach and chronic cystitis of eight years' duration. The urine showed a large amount of pus but no involvement of the kidney, though when a young man a calculus had been passed. Other history negative. In December, 1906, he exerted himself too severely while at work and as a result had a severe orchitis. This yielded to treatment, but on Feb. 2, 1907, there was a beginning of prostatic symptoms, among others a frequency of urination (arising as many as six times a night) with pain and burning about two inches from the end of the penis. In spite of treatment, however, the patient grew gradually worse until April 15th, when he was able to void only about half an ounce of urine at a time. There was also a marked phosphaturia and about 60 CC. of residual urine.

May 2, 1907. First exposure.

May 8th. Second exposure.

May 27th. Third exposure.

Internal medication was then stopped and the patient enjoyed complete comfort until June 27th, when the entire train of symptoms returned in a much aggravated form.

July 6th. Fourth exposure. Some relief but a slight toxæmia occurring as a delirium.

July 16th. Fifth exposure. Continued improvement, though a slight delirium still occurs. Retains urine as long as two hours at a time.

July 22nd. Sixth exposure. Improvement continues; voids urine with very little trouble.

July 31st. Seventh exposure. Retains urine as long as normal; only rises once or twice at night. Feels as well as he ever did and passes a large stream.

August 12th. Eighth exposure.

August 25th. Ninth exposure. Patient is symptomatically well. No untoward symptoms. Rectal examination reveals a prostate only moderately enlarged. The residual urine has been reduced to 15 CC.

Sept. 8th. Tenth exposure.

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October 29th. Eleventh exposure. The residual urine has been reduced to 8 CC.

No further exposures were given nor was any other further trouble experienced until the middle of June, 1908, when the patient had a severe diarrhea with considerable straining at stool. This frequency of defecation, together with old age and an increasing weakness, caused a return of the prostatic symptoms. He voided every half hour during the day, arose six and eight times at night, suffered severe pain in bladder and penis and went to bed.

June 29th, 1908. Twelfth exposure.

July 1st. Thirteenth exposure.

July 3rd. Fourteenth exposure. A slight relief.

July 12th. Fifteenth exposure. A great improvement. Patient rests better, does not arise more than three times at night and requires less anodyne.

July 25th. Sixteenth exposure. Save for an extreme weakness and a large amount of urination in the early morning, the patient is symptomatically well.

August 1st. Seventeenth exposure.

August 19th. Eighteenth exposure. The patient arises only once or twice at night and is gaining in weight.

September 18th. Nineteenth exposure. The residual urine varies from 8 CC. to 17 CC. Patient remains well.

From this time until his death from cerebral hemorrhage in January, 1909, he remained entirely free from prostatic difficulties. This case, though reported in part on two previous occasions (American Journal of Medical Sciences, Jan. 1908, and Old Dominion Journal of Medicine and Surgery, Jan., 1909), is of such interest that I have here reported it in full.

Case II.—Professor A. L. S., French teacher, eighty-four years, married, no children. Had suffered with enlarged prostate for many years, had had several acute attacks, and was obliged to use the catheter. His general health, however, was excellent. There were no urinary complications, probably on account of his having taken large amounts of hexamethylen. When first seen on June 16th, 1909, there

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was a very large and very hard prostate with about 32 CC. of residual urine, also an old intertrigo involving the inner thighs and part of the scrotum.

June 16th. First exposure.

June 18th. Second exposure. Prostate somewhat smaller. Residual urine reduced to 20 CC.

June 19th. Third exposure.

June 21st. Fourth exposure.

June 24th. Fifth exposure.

About this time, as there was a considerable dermatitis with an exaggeration of the intertrigo, the patient was advised to wait. On account of the hot weather he decided to return in the fall. But this he failed to do, and though I have heard from him occasionally, I think that the permanent benefit was only slight.

Case III.—Referred by Dr. R. S. Spilman and treated in conjunction with him. Dr. C., physician, aged seventy, married, two children. Five years ago had consulted a surgeon in Cincinnati and requested a prostatectomy, but on account of his poor condition this had been refused. At that time he was treated by intravesical irrigations of boric acid solution with considerable benefit, but during the last year his condition had rapidly become worse; had had several chills. When first seen on Dec. 11, 1909, there was a continual passage of urine and feces with pain and great tenesmus, a very large and hard prostate, some hemorrhoids and large congested testicles. His condition was exceedingly poor. The residual urine equaled about 450 CC. and was of a milky color; about one half was sediment, pure pus. In other words, the patient when seen was moribund.

Dec. 11th, 1909. First exposure.

Dec. 14th. Second exposure.

Dec. 16th. Third exposure.

Dec. 18th. Fourth exposure. Patient retains urine one hour.

Dec. 20th. Fifth exposure. Retains urine one hour and a half.

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Dec. 22nd. Sixth exposure. Retains urine two hours. Less tenesmus.

Dec. 24th. Seventh exposure. About the same. Prostate somewhat smaller and harder.

Dec. 27th. Eighth exposure. Feels much better, though retains urine only about an hour. Hemorrhoids much better; testicles normal in size.

From this time until Jan. 27, 1910, no exposures were given, though the bladder was irrigated and hexamethylen administered. The residual urine varied from 375 CC. to 600 CC.

Jan. 27th. Tenth exposure.

Feb. 2nd. Eleventh exposure.

Feb. 16th. Twelfth exposure.

Feb. 26th. Thirteenth exposure.

There was little further improvement, though the residual urine was reduced to about 135 CC. His death from pyonephrosis occurred about four weeks later.

CASE IV.—Referred by Dr. H. M. Nash. Judge S., lawyer, sixty-eight, married, one child. Had been suffering six months with prostatic symptoms, which had been gradually getting worse. Arose two or three times at night and had had to use a catheter on several occasions. First seen on Feb. 12, 1910. Prostate moderately enlarged and fairly hard. Urine normal. As the patient requested that no catheter be passed into his bladder, I am unable to give the amount of the residual urine.

Feb. 12, 1910. First exposure.

Feb. 14th. Second exposure. Patient feels better.

Feb. 16th. Third exposure. Patient urinates as well as he ever did.

Feb. 18th. Fourth exposure.

Feb. 21st. Fifth exposure. Patient feels much better.

Feb. 23rd. Sixth exposure.

Feb. 25th. Seventh exposure.

Feb. 28th. Eighth exposure.

March 3rd. Ninth exposure. Patient rests the entire night. Normal urination.

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A second series of exposures for prophylaxis were given as follows:

April 7th. Tenth exposure.
April 11th. Eleventh exposure.
April 14th. Twelfth exposure.
April 17th. Thirteenth exposure.
April 21st. Fourteenth exposure.
April 25th. Fifteenth exposure.
April 28th. Sixteenth exposure.
May 2nd. Seventeenth exposure.
May 5th. Eighteenth exposure. Prostate reduced in size and soft.

From April 11th to June 10th, prostatic massage was also given with the result that the patient continued to improve. Slept the entire night with no pain upon urination, and the practical disappearance of the prostatic enlargement. He complained, however, of a slight irritation of the deep urethra, which was promptly relieved by the passage of a sound. From this time until July 1, 1911, he remained free from prostatic symptoms. On that day I was again consulted and found his prostate somewhat enlarged. It was massaged and also on the 21st. Roentgen ray exposures were given on August 2nd and 6th. All of the symptoms have disappeared and the patient remains well.

Perhaps in the light of this case we can understand Bangs' somewhat contradictory statements.

CASE V.—Mr. A., merchant, sixty-eight, married, three children. Has had prostatic symptoms for about two years; a few months before had had a severe orchitis, resulting from some heavy lifting. Arises four or five times at night. Urinates about every hour and a half during the day, has hemorrhoids and some tenesmus; sleep disturbed. First seen on October 24, 1910, when an examination showed a rather large and moderately hard prostate, with a residual urine of 25 CC. The urine was cloudy and contained pus but no casts. Pulse tension equaled 140 MM. of mercury.

Oct. 24, 1910. First exposure.
Oct. 25th. Second exposure.

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Oct. 27th. Third exposure.

Oct. 31st. Fourth exposure.

Nov. 2nd. Fifth exposure. Prostate slightly smaller. Residual urine 20 CC.

Nov. 5th. Sixth exposure.

Nov. 8th. Seventh exposure.

Nov. 12th. Eighth exposure.

Nov. 17th. Ninth exposure. Residual urine still 20 CC.

Nov. 25th. Tenth exposure. Sleeps from three to four hours between urinations.

During this series of exposures the bladder was also irrigated and the prostate massaged, while hexamethylen and boric acid was internally administered. The residual urine varied from 20 CC. to 50 CC. On Dec. 9th, the residual urine was 23 CC., while he slept the night before as long as four and a half hours between urinations. On Dec. 24th, he arose only twice during the night, while during the day he went as long as four or five hours between urinations.

Dec. 26th. Eleventh exposure. Residual urine 14 CC.

Dec. 27th. Twelfth exposure.

Dec. 31st. Thirteenth exposure.

The irrigations were continued and on Jan. 7th the residual urine was 8 CC. But from Jan. 13th to Feb. 5th, he was confined to bed by a blistered perineum brought on by his own application of hot compresses in the hopes of easing hemorrhoids. The healing however, was complete. Irrigation of the bladder and massage of the prostate were again begun with the use of sounds and some applications of argyrol to the deep urethra. When last seen on April 8, 1911, his urine was still cloudy, he arose only once (or at most twice) at night, went about four hours between urination during the day and slept well. His prostate showed only a very slight enlargement and the testicles were normal in size. In short, save for the cloudy urine he appeared symptomatically well.

He was, however, not entirely satisfied and consulted an eminent genito-urinary surgeon in a neighboring city. I have since learned that a papilloma was removed from the bladder and the remaining prostate through a supra-pubic opening.

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CASE VI.—Dr. E., a dentist, fifty-eight, married, three children. Had been complaining for several months of prostatic symptoms, gradually becoming worse; urinated every half hour, day and night with great pain and tenesmus; had been treated by a New York electro-therapeutist with a high frequency rectal electrode without avail. He was rapidly becoming worse. First seen Dec. 6, 1910. At that time I found a large soft prostate and a strictured urethra. The urine was phosphatic and contained pus. Operation was advised for the stricture, but refused.

Dec. 6th, 1910. First exposure.

Dec. 7th. Second exposure.

Dec. 8th. Third exposure.

Dec. 10th. Fourth exposure.

Dec. 14th. Fifth exposure. No relief. An attempt was made to pass a sound in the office but it was not successful. An operation was again advised and this time accepted.

Dec. 23rd. Operation, St. Vincent's Hospital, myself; forceful dilatation of the urethra under anaesthesia to a 29 F. sound. Even then, strange as it may appear, I was unable to catheterize him. That afternoon he emptied his bladder, unassisted, the first time in many months. A rectal examination made at the time of the operation showed the prostatic tumor almost gone.

Jan. 4th, 1911. Sixth exposure.

Jan. 26th. Seventh exposure. Treatment by sounds has been continued. Prostatic symptoms have entirely vanished.

When last seen on May 27, 1911, the patient was advised to continue passing the sounds. His urine, though still very bad, was gradually improving under the use of antiseptics; with the exception of an occasional tenesmus, the old symptoms had entirely vanished.

Of course, in this case it was the dilatation of the urethra that brought about the greatest relief, but to the application of the Roentgen ray must be ascribed the disappearance of the prostatic tumor.

CASE VII.—Judge E., merchant, seventy-six, widower, three children. Had been suffering with prostatic symptoms

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for three or four years, arose every two hours during the night. First seen April 4th, 1911. Examination showed a prostate slightly enlarged and soft. Urine normal. Residual urine 27 CC.

April 4th, 1911. First exposure.

April 6th. Second exposure.

April 8th. Third exposure. Improvement.

April 11th. Fourth exposure. Arises only twice during the night and considers himself much better.

Further exposures were then discontinued on account of a business trip (the patient's). When seen on May 18th, he was advised on account of the hot weather to discontinue the treatment until the fall. When seen July 11th, he reported a continuous improvement.

The technique in the treatment of hypertrophied prostate is largely one of individual preference. It is a question of position and dosage. Thus Robarts treated his cases while seated upon a chair, there being a window in the seat exposing the perineum. The tube was placed below. Gautier irradiated both perineum and lower abdomen. Carabelli and Luraschi placed their patients upon an inclined plane. Tansard and Fleig used a specially constructed diaphragm. Lasseuer and myself prefer a Simms' position. He first irradiates the prostate at right angles to the line of its axis; later directly upon the perineum. My own cases have been treated in the latter way. Moszkowicz and Schlagintweit employed a rectal speculum, but this feature of their technique has been greatly condemned.

Many of the operators have advised the protection of the testicles by lead foil. They claim that the danger of sterility is thus avoided. In my own series of cases I have found in almost all an abnormal increase in the size of the testicles, most of which in my opinion has been due to the congestion resulting from straining. So I have also irradiated the scrotum in all cases save one. I have found great relief and further a return to the normal size. And as what we wish is a reduction of the prostatic symptoms, and a double castration has often accomplished this end, I am of the opinion that the irradiation

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of the scrotum is a thing eminently to be desired. Of course we are now speaking of the prostatic hypertrophy of elderly men. We are not discussing these enlargements in younger subjects due to gonorrheal infection.

The question of dosage is most important. Many operators have prescribed specific amounts. Thus Tansard and Fleig prescribed 5 Holznecht units during the first series of irradiations and another 5 H. during the second. All prefer moderately high and well-seasoned tubes. Tansard and Fleig specify a No. 7 on the Benoist radio-chronometer. Schlagintweit, a No. 7 in the Wehnelt scale. Personally, my work has all been done with coils, of which I have had three, one of twelve-inch spark length and two of eighteen inches. I have also used both mercury and Wehnelt interrupters. My present technique follows that used in the treatment of skin affections save that the tube must be hard and well-seasoned. I try to place three or four layers of the primary of the coil in series and to use from four to six amperes of current with a Wehnelt interrupter, that is from one and one-half to two milliamperes in the secondary circuit. Exposures of from five to ten minutes are given at frequent intervals and until a moderate dermatitis has resulted. Sometimes I employ the leather filter. But there is one thing upon which I do insist. The full physiological dosage must be given. And this varies in different individuals.

Thus we see that the treatment of hypertrophied prostate by the Roentgen ray is closely akin to that used in exophthalmic goitre. It is largely a question of the histological structure of the gland. If the growth is young (and consequently a hyperplasia due to the increase of epithelial and glandular tissue), we may expect brilliant results. On the contrary, if there has been much increase of the muscular or fibrous tissue, it is only by the greater contraction of this tissue that relief can be accomplished. Massage is indicated as an adjuvant in these cases. In the third degree but little benefit may be expected. Aside from the relief of the localized congestion, there will be no improvement in the symptoms. Muscle tissue and old fibrous tissue will not yield to the Roentgen ray. To con-

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clude: We have in the Roentgen ray a valuable treatment in cases of hypertrophied prostate. As there is no question of mortality all sufferers may be subjected to its influence. If there is to be an improvement, it will be rapid. If no improvement occurs in a reasonable time, other treatment must be considered.

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ROUTINE POST-OPERATIVE ROENTGENIZATION IN CANCER.

BY CLARENCE EDWARD SKINNER, M. D.
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At the annual meeting of one of the state medical societies this year a paper was read, by a surgeon whom we will call Dr. A., in which were extolled the advantages of early ablation in cancer of the breast—not a new subject by any means, but nevertheless one which cannot be kept too prominently before the medical mind. The X-ray was pessimistically referred to in this paper.

A surgeon considered to be one of the foremost in the state, whom we will call Dr. B., was on the program to discuss this paper. He referred to the X-ray in cancer therapy as follows: "I want to thank Dr. A. for giving me an opportunity to say that of all the rot that ever occurred to the medical profession, the idea that X-rays will cure cancer is the thing. More harm is done in the attempt to treat cancer of the breast by means of the X-ray than all the good ever done. I wish the X-ray had never been discovered. It does not do a particle of good in this condition; it is nothing but an opportunity for delay. There has been a good deal said lately by the X-ray people regarding the after treatment of cancer of the breast with the X-ray. I have no objection to the 'X-rayists' making a little money in that way; ***they could not do so by honest work.*** I have seen and have had cases of cancer of the breast in my patients treated with the X-ray after operation. Some of the cancers have returned, and some have not. Those that did were bound to return, probably on account of my bad operation. It had not been extensive enough and the cancer returned in spite of the X-ray. In the cases in which the results of the X-ray treatment were apparently favorable, I do not believe that the cancer would have returned anyway."

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An earnest advocate of roentgenotherapy in cancer who was present, felt that he could not permit such a vehement denunciation of the X-ray and X-ray therapeutists to pass without comment. He replied as follows:

"I am an 'X-rayist,' as Dr. B. has just dubbed it. When an 'honest' man like Dr. B. gets up and castigates the X-ray, to say nothing of the 'X-rayist' as he has just done, it means one or more of three things: he has not carefully and judiciously weighed the evidence concerned in the matter (of which there are volumes at his command), he has not had an opportunity of seeing the X-ray properly applied to the management of cancer, or he has lost his temper." He then stated his reasons for believing that routine post-operative roentgenization was not only justified but imperatively indicated in cancer.

A patient to whom had been administered fourteen post-ablative roentgenizations for mammary cancer by one of our Connecticut X-ray therapeutists, about three months ago, became alarmed at a mild dermatitis which had been induced and consulted two prominent New York surgeons as to the necessity of undergoing X-ray treatment after thorough ablation. Her unwillingness to continue the treatments upon recommendation unsupported by surgical approval, was further emphasized by the fact that she lived in a city fifty miles distant and the journey back and forth twice weekly was very irksome to her.

These surgeons told the patient that they were willing to assume the entire responsibility of letting her discontinue the X-ray and, to quote her own words, "The biggest and best of the two, having had experience with that treatment himself, had utterly discarded it in these cases, and said that he also had the definite opinion of a man who had experimented with it more largely than he had, that he entirely disbelieved in its efficacy, and that the rays were potentially harmful."

This was a particularly unfortunate case from the X-ray standpoint, because in case this patient's cancer does not return the fact that she stopped the treatments before the course was completed will lead her and her surgeons to believe that no beneficial effect was exercised by the X-ray, that the cancer

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would not have returned anyway, and if it does return, she and her surgeons will be convinced that it did so in spite of the X-rays; and there is absolutely no chance to argue successfully against the error of either of these positions.

The wide-spread prevalence of such bitter antagonism toward X-ray therapy in cancer, on the part of perfectly sincere and honest members of the surgical profession, seems to me to demonstrate that a grave duty to humanity imperatively confronts the members of this society, viz: the inauguration of an earnest, vigorous and persistent campaign for the enlightenment of the lamentable ignorance which withholds from the cancer sufferer the beneficent potentialities of prompt, post-ablative roentgenization; a campaign which shall consist of repeated presentations before our county and state societies of the many available evidences that the X-ray indubitably exercises a positive, curative influence over malignant processes. Cancer victims are going to continue to look to the surgeon for guidance in the management of their ailment, hence as long as he lingers under the burden of misapprehension which is responsible for his present skeptical attitude, just so long will lives continue to be lost that might have been saved and suffering endured that might have been avoided.

The potency of the X-ray influence over malignant processes once demonstrated, however, its prompt, post-ablative employment, in every case, without waiting for recurrence, becomes a logical sequence for the following reasons:

First, because it is not justifiable, in a disease as terrible and elusive as cancer, to omit the application of any measure which has demonstrated its capacity to increase our power over the disease.

Second, because it is impossible to tell at the time of operation in which cases recurrence is going to take place; hence, in order to be sure that the cases which will need it will be treated, it is necessary to apply the measure to every case.

Third, because early recurrences are frequently internal, hence undiscoverable until such organs and tissues have been involved as to render absolutely useless the application of any remedy at present known.

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Fourth, because many recurrences are more vicious and resistent to roentgenization than the original lesion.

These two last-mentioned reasons explain why many cases are hopeless under roentgenization which might have been saved had the remedy been applied immediately after the operation, before internal metastasis had occurred and while the malignant foci were miscroscopic in size.

Fifth, because when the X-ray has been thoroughly and skillfully applied immediately after the operation, it is known that everything has been done that offers the patient a chance of recovery, and if the case eventuates unhappily neither physician, patient nor the patient's family or friends will have cause to reproach themselves for having left undone something which might have altered the outcome had it been applied at the proper moment.

Objections which have been urged against prompt, routine, post-operative radiation are as follows:

First, many patients will thereby be subjected to the treatment who would have no recurrence anyway, and such cases would be treated unnecessarily.

This objection loses its force when we recall that the only way in which we can be sure of treating those cases in which recurrence will take place, is by raying *every* case, even though this involves unnecessary treatment in some cases. Properly applied X-ray treatments do no harm, even if they are unnecessarily given. On the other hand, much harm, in many cases irreparable harm, follows delaying X-radiation until recurrence has manifested itself.

Second, the expense involved in X-ray treatment is considerable and it may seem unjustifiable to inflict it upon a patient who has not *demonstrated* that he is going to need it.

The desirability of preventing recurrence is so great that the expense involved becomes a negligible factor. If recurrence takes place the original operation might just as well not have been performed at all. The money spent on any measure which offers a reasonable promise of diminishing the chances of recurrence, then, is as well spent as is that spent upon the operation itself.

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The answer to the first objection applies here also, viz., that by the time the patient has demonstrated that he is going to *need* the X-ray for recurrence, it will frequently be too late for the procedure to be of use to him.

Post-operative roentgenization also renders it possible to save some members of a class of cases which are hopeless under ablative treatment alone and usually hopeless under X-radiation alone, viz: Those in which the neoplasm has become so extensive that it cannot be completely removed by the knife. I am aware that the X-ray alone will occasionally cure a case of this sort, but as a rule the X-ray alone will fail in such cases. By combining the knife and the ray, however, by first removing as much of the malignant tissue as possible and then roentgenizing immediately, not necessarily even waiting for the operation wound to heal in such a case, the cancer can sometimes be destroyed and the patient saved. The X-ray can frequently destroy small masses of cancer tissue when it could not destroy large masses, and initial extirpation of as much as possible of the growth reduces the amount of therapeutic work demanded of the ray.

Some operators recommend that such cases should be rayed before operation and the fact that reliable men report good results from this method of administration shows that it has value, but I do not approve of it as a routine practice for the following reasons:

First, the usual effect of vigorous X-radiation of a malignant growth is to produce a certain amount of systemic toxemia which has been known to be severe enough to kill the patient of itself. Pre-operative radiation is likely, therefore, to produce more or less depression of the vital powers and it does not seem logical, to me, to invite systemic depression just before an operation.

Second, radiation of parts containing malignant tissue causes fibrous tissue to take the place of the malignant tissue, and frequently results in such a fusion of tissues and obliteration of normal tissue distinctions and relations as to seriously embarrass the operator during the subsequent ablative procedure.

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Third, if the ray is capable of influencing the total original mass of such a growth happily, it will surely be capable of producing a much greater beneficial influence after the mass had been materially reduced in size by partial extirpation.

Fourth, and to my mind *most* important, effectual preoperative radiation means delaying the operation for weeks during which time the neoplasm is constantly threatening extension. It seems to me distinctly inadvisable, to say the least, to subject the patient, by election, to such an ominous possibility.

One other point that we ought to bring prominently before our surgical and medical confreres is that the *efficient* application of the X-ray to the management of cancer can only be accomplished by a competent and experienced roentgenotherapeutist. There are hundreds of good radiographers but those who are competent to treat cancer with X-rays are very few when compared with the total number of those who are using X-rays. A good radiographer is by no means necessarily a good roentgenotherapeutist, and certainly not necessarily competent to apply the X-ray to cancer. I believe that the present attitude of the general medical and surgical profession towards X-ray therapy in cancer is very largely due to the fact that thousands of men have attempted to treat this disease by X-rays during the last ten years and that only a very small proportion of these men have had sufficient knowledge of the agent and experience in its management to render them competent. The results in the vast majority of the cases in which the agent has been administered to date, therefore, have not been fair exemplifications of its therapeutic capacity.

The preponderance of the argument, then, being very largely in favor of applying the X-ray after *every* ablation for cancer, the medical adviser's duty to his cancer patient cannot longer be reconciled with omission to urge this procedure in connection with every case, and the text of the proposition which it is the imperative duty to humanity of the members of this Society to demonstrate to the profession (especially the surgeons) may be briefly stated as follows:

First, the X-ray has demonstrated that it exhibits a powerfully curative influence over malignant degeneration. hence

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its routine addition to ablative measures will increase greatly the number of curable cancer cases.

Second, it is impossible to tell beforehand which cases will need roentgenization and which will not, or which will respond happily and which will not respond at all; hence the only way to be sure of treating all cases that will need it and all that will respond, is to treat *all* cases.

Third, roentgenization should be commenced as soon after operation as is consistent with the safety of the tissues involved in the operation wound, and before recurrence has had an opportunity to manifest itself.

Fourth, the application of the remedy should be entrusted only to those who are competent and experienced, and conclusions based upon results obtaining in cases which have been treated by other than competent and experienced roentgenotherapeutists, are unreliable and misleading in the highest degree.

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CARCINOMATOSIS OF THE BONE, SECONDARY TO A GROWTH IN SOME EPITHELIAL ORGAN.

BY RUSSELL H. BOGGS, M. D., PITTSBURG, PA.

Carcinomatosis of the bone has received very little attention from the fact that the bony changes in most cases have not been sufficient to excite clinical notice. Since so much attention is now given to bone diseases, some of these cases are now being referred for radiographic examinations. The disease is never primary, always secondary. For this reason it is seldom recognized until a fracture takes place.

The first case that I saw was a patient who had been operated upon for carcinoma of the breast five years previous. She had had three operations, one three years after the first, and the third a year later. Her first symptoms were of severe pain in the region of the right hip and sacroiliac articulation. She had a few nodules studded over the chest, which cleared up under X-ray treatment. She had complained of the pelvis symptoms a month before she started to take treatment. Her physician insisted that she was hysterical and had become addicted to morphine.

While stepping off an elevator, she made a misstep and complained so much of pain that we were compelled to give her a half grain of morphine. Neither her physician nor myself made any examination of her hip, but a month later she insisted on having a surgical consultation. The surgeon at once pronounced a dislocation of the head of the femur and referred her for an X-ray examination.

The examination revealed bony changes, which might be described as honeycombing of the shaft.

I have seen three similar cases where spontaneous fractures occurred following carcinoma and three more cases where the spine and pelvic bones were affected.

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Dr. G. W. Hawley describes a similar case to the one I reported and has dealt in detail with skeletal carcinomatosis in an article which was published in the Annals of Surgery, May, 1910.

I would like to mention another case briefly on account of extensive bony destruction in addition to mediastinal involvement.

This patient was operated upon six years ago for early schirrous carcinoma of the breast. She was in fairly good health for three and one-half years. Then she began to complain of pain in the lumbar spine and sacroiliac region. The pain was constant and she soon became bedfast. The radiograms showed extensive bony changes in the pelvis, spine and ribs. About a year later, radiograms were again taken, which showed very little more bony destruction. This patient did not have any external recurrence.

The cases mentioned were secondary to chirrous carcinoma of the breast, and none of the patients had a recurrence in from three to five years. This would seem that carcinoma of the bone is much more common in a slow growing form than a tumor of rapid growth.

I will quote the following in regard to the pathology from Dr. Hawley's article, as he describes it:

"Von Rencklinghausen found that the invasion began in marrow, which was usually found studded with nodules of cancer tissue. In the long bones these occurred most frequently in the expanded extremities; in the vertebrae throughout their bodies. This is in accord with the theory that the invasion of the bone occurs via the blood stream since Lexer has pointed out that the metaphyses are the most vascular parts of bone.

"These cancer nodules (usually found in groups) rarely attained any great size. Occasionally it was more miliary in character.

"This invasion of the marrow leads to a low grade osteoporosis (called by Von Rencklinghausen, 'osteomalacia carcinomatosa') which often extends from the central canal to the periosteum, with nests of cancer cells scattered through-

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out the Haversian canals. Extension to the periosteum is productive of a fibro-periostitis with formation of new bone. New bone formation also occurs in the marrow. These two processes, osteolastic and osteoplastic, as a rule, are not productive of extensive alteration in the architecture of bone."

In conclusion, carcinoma of the bone is not so rare as generally supposed and it is of clinical interest in connection with lumbago, chronic rheumatism, etc.

It has even been stated that metastasis in the bone is frequently the first evidence of a prostatic tumor.

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SOME OBSERVATIONS ON THE MULTIPLE SPARK GAP IN SERIES WITH X-RAY TUBES.

BY DR. QUINBY.

While the greatest efforts of the present day are toward the bringing forward of new theories and facts, a review of some of the older features of our work sometimes does not come amiss, and although the subject presented here is old to many of us, some may reap value from reviewing this matter anew.

Looking over literature on the use of the multiple spark gap in series with X-ray tubes did not meet my expectations, most authors describing multiple spark gaps as a device consisting of a series of metal balls arranged at a suitable distance apart, with a metallic rod connecting them, to aid in selecting the number of gaps desired.

One European writer gives a good description of the point and disc gap, defining the best proportions to produce the most desirable results in eliminating inverse manifested in X-ray tubes.

My practice the last few years has been to maintain a permanent air gap of about one-fourth to three-fourths inch at the cathode end of the tube in all treatment work, as I found by experience that tubes would maintain vacuum longer during the irradiation, while in radiographic work I frequently used a three-fourth inch air gap; however, I found that the total air gap was best determined by the potential of the secondary and condition of the tube.

In experimenting along these lines I have made a number of spark gaps in an endeavor to determine the best proportions for my individual machine. So far my work has been confined to fitting up three coils and three transformers that I have used in private practice. I have become convinced that the best results are obtained when a suitable amount of metal surface is employed to carry the amount of current used, and

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that the best results are not obtained by using any spark gap indiscriminately on any one machine.

About a year ago my attention was called to the report of the discussion on a paper read at the Royal Society of Medicine where something was said concerning the use of an air gap at one or both ends of the tube to increase penetration and reduce heat production. About the same time, while experimenting with a point and disc multiple spark gap, I put it on a transformer to try the effects of reversing the current passed across it, and while doing so became satisfied that when it was used in the regular way with the current going from point to disc the penetration or clearness of the shadow was much improved. Both ends of the tube and various numbers and spacings of the spark gap were tried which quickly proved what was the most satisfactory arrangement. Very low tubes offering little resistance would take in six quarter-inch spaces while higher tubes did better with one or more gaps of the same length; also that the vacuum was maintained best when the device was used on the anode terminal.

Trying this out in practical radiography, I have taken about four hundred pictures with the spark gap on the transformer, and concluded that it gave several desirable results.

First: More of the capacity of the machine could be used without the troublesome sparking on the commutator of the motor generator.

Second: My exposures were shortened.

Third: I could take more pictures in rapid succession with one tube and maintain a good vacuum in it.

Fourth: New unseasoned tubes could be used with as desirable results as could be obtained with old and seasoned ones.

Fifth: The vacuum of the tubes rapidly increased. This was more or less permanent, calling for new chemical regulators in a short time, which difficulty was overcome by an improvement in the chemical constituents of the regulator.

Sixth: There was not the haziness to the image that was often seen on radiographs taken by the transformer.

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Seventh: The tubes apparently did not heat up as rapidly as when connected direct to the terminals.

After feeling convinced of what I had seen of the effects of using the spark gap, a further test of what was the actual effect on the tube was made by the following methods:

Making a glass sleeve of suitable size and length to fit over the cathode stem with a wide rubber band at each end to aid in closing it snug around the stem to retain the heat. A thermometer was then inserted between the glass sleeve and stem so that the mercury bulb lay close to the cathode stem, but not in contact with it.

Six tubes were selected, all varying in amount of use to which they had been subjected—five seven-inch tubes of one make fitted with the improved regulator, and one six-inch tube of another make.

To allow them to cool and rest they were tested but once a day. The tests were made for penetration and relative temperature, which the inductants and resistance in the primary, also the amount of time of excitation was recorded, as you will see by the accompanying charting of the readings. The excitation of the tubes was thirty seconds.

The first test no spark gaps were used, and the average of the penetration reading for the six tubes was five and two-thirds Benoist scale. The atmospheric temperature that day was about sixty-nine, which I think reduced the temperature reading some.

The second test with four one-fourth inch spark gaps, total one inch air gap. The penetration was six and one-half, while the temperature, although the atmospheric reading of seventy-one and a half, was a little lower than the previous test.

Third test, one spark gap equaling one-fourth inch air gap, average penetration six and one-fourth, temperature about the same.

Fourth test, two spark gaps, equaling one-half inch air gap, average penetration six and three-fourths.

Fifth test, no spark gap in circuit, resulting in a low average penetration, five and five-sixths, and the temperature average very high, about 96F.

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Sixth test, three spark gaps with an average of seven and one-sixth penetration, with a temperature of eighty-nine, or seven below the previous reading.

From these tests the following conclusions can be drawn:

First: The higher the penetration the more heat produced.

Second: The spark gap does not raise the penetration as much as would be expected from experience in taking radiographs although it does raise it about one unit.

Third: The spark aids in shortening the exposure two ways. First, by increasing penetration; second, by enabling us to use more current in the primary.

Fourth: The spark gap eliminates a lot of low penetration rays that tend to flatten the image on the fluorescent screen and photographic plates.

Fifth: The milliampere readings show that this unit has no bearing on the penetration or results you obtain, except with a given tube.

Sixth: The size of the disc and total of the metal surface is a factor in using a multiple spark gap. The greater the quantity of current the larger the disc should be.

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PATHOLOGY REVEALED BY THE ROENTGEN RAYS IN CASES OF NEURASTHENIA, NEUROSES, AND OTHER CASES OF INDEFINITE DIAGNOSIS.

BY A. F. HOLDING, ALBANY, N. Y.

The history of the errors of omission committed by making the diagnosis of "neurasthenia" too readily will probably never be fully written, and every diagnostic agent that will help the medical profession to save patients from the consequences of such errors of diagnosis should be employed before we accept the diagnosis of primary neurasthenia as final. As our profession advances in science, the diagnosis of primary neurasthenia becomes proportionately rare; and this diagnosis is in reality more of a confession of our limitations in the knowledge of morbid processes than a scientific classification of disease. Every new diagnostic agent will have ample opportunity of proving its value by revealing the real primary cause in cases heretofore classified as neurasthenia and in cases of indefinite diagnosis. No agent has achieved greater distinction in this respect than the Roentgen rays, and as the rays are used more and more intelligently their value in this class of cases will become more generally recognized, so much so in fact that I am beginning to believe that the diagnosis of primary neurasthenia without having had recourse to the Roentgen rays is unjustified.

In preparing the first draft of this paper so many instructive cases presented themselves to memory that the paper soon became too voluminous and it was necessary to divide the cases into groups. The case groups selected are as follows:

1.—Anatomical anomalies.

2.—Diseases of the mouth.

3.—Diseases of the œsophagus.

4.—Diseases of the stomach.

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5.—Diseases of the intestine.
6.—Diseases of the chest.
7.—Diseases of the kidneys.
8.—Diseases of the extremities.
9.—Infectious diseases.
10.—Fractures and dislocations.
11.—Foreign bodies.

The object of this paper is not to usurp all the credit of diagnosis for the Roentgen rays but rather to emphasize the very direct, distinct and satisfactory value of these rays sometimes in establishing the diagnosis, and always in elucidating obscure diagnoses.

I will cite briefly an illustrative case in each group, showing lantern slides of each case. At some time during their career, all of these cases have been diagnosed by competent clinicians as cases of neurasthenia; and all of the cases were neurasthenic in the sense that through their sufferings they were extremely nervous and had lost their nervous poise, that is, secondarily neurasthenic.

CASE I.—Obscure progressive paralysis of arm proved by the Roentgen rays to be due to a supernumerary rib. A young woman, aged twenty-three years, who had noticed for the past three years that the right arm was getting weaker than the left. Onset was gradual and no traumatic, infectious, or other etiological factor was apparent. She had consulted several physicians and tried various lines of treatment including liniments, massage, heat, electricity, etc., without arresting the progress of the condition. Patient was a nervous individual, below par in nourishment and some of her medical advisers considered the condition one of neuritis, an obscure nerve paresis, or neurasthenia. Patient examined by Dr. Wm. Kirk, of Troy, N. Y., and a mass discovered in the right side of the neck; later, she was examined in consultation by Drs. Hun and Elting, who came to the conclusion that the case was one either of sarcoma or supernumerary rib. Radiographic examination established the diagnosis of supernumerary rib.

CASE II.—Epileptiform convulsions proved by the Roentgen rays to be a case of unerupted teeth. A child aged twelve

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years, who for four years had had convulsive seizures characterized by clonic spasms of the entire body, followed by stuperous sleep. At first these seizures occurred at intervals of six months but the intervals became shorter, latterly occurring as often as once a month. These attacks had no aura, no tonic spasms, no frothing at the mouth, otherwise they resembled the convulsions of grand mal. The child was poorly nourished and underdeveloped, was depressed and dull mentally, subject to vague fears and emotional attacks of an hysterical nature, weeping, etc. The various bromides, including strontium had been used with and without arsenic to the point of bromism; with benefit but without relief. Following the publication of the remarkable cases of neuroses due to dental conditions reported by Dr. Upson of Cleveland, a radiographic examination was suggested and two unerupted teeth shown. Following the extraction of the two milk teeth and the successful eruption of the displaced canines, the symptoms gradually abated, and six months later the patient had made a complete recovery from the convulsions and his general and mental condition showed steady improvement. During his entire sickness there had been no toothache nor pain of the face or jaw.

CASE III—Cardiospasm, referred by Dr. MacFarlane, of Albany. Young man, aged eighteen years, four or five years ago noticed that it was easy to regurgitate food; this occurred about once a week and at first liquids only regurgitated. This gradually occurred more often and two years ago solid food first regurgitated when he ate hurriedly or did not chew well. He would rechew this food and then swallow it. This has gradually grown worse so that he regurgitates and rechews food every meal. Has not lost weight or strength. Has a feeling of pressure under the lower part of the sternum when he swallows. Sour food distresses him more than sweet, and cold than warm food; solid food more than liquid. Less trouble in swallowing when he is less nervous, when he eats in a reclining position and when the bowels are regular. Has noticed that when he ate several courses that he would regurgitate the first food taken first. On passage of a stomach tube

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about thirteen inches part of the test breakfast comes up unchanged and when the tube was passed into the stomach the contents showed complete digestion. This case was correctly diagnosed by Dr. A. MacFarlane of Albany, who referred the case and the diagnosis was confirmed by radiographic examination.

In contradistinction to the shadow given by the cardiospasm, permit me to show a radiograph of a case of carcinoma of the œsophagus and one of stenosis due to swallowing of potash in solution.

CASE IV.—Neurasthenia with obscure constant locus of pain, shown by the X-ray to be due to an "hour-glass" contraction of the stomach. For twenty years the patient had been regarded and treated as a neurasthenic and her peculiar pain as part of her symptom complex. The pain became particularly distressing when she was in an exhausted nervous condition. Her treatment had consisted of nerve sedatives, tonics, etc., her symptoms were continually relapsing and the list of her attending physicians was proportionately long. A radiographic examination showed the real nature of the trouble to be an hour-glass contraction of the stomach and on close questioning an indefinite history of hematemesis and a bloody stool was elicited which might have been symptoms of an antecedent ulcer of the stomach. The main value to date of the radiographic examination has been to explain to the patient's satisfaction the cause of her pain and why it must be expected to recur, which has led to more faithfulness and constancy in her treatment and to date she has not felt the necessity of submitting to operative intervention.

CASE V.—Auto-intoxication, constipation, nervous prostration, with flatulence, pyrosis, etc., long regarded as a case of neurasthenia. A radiographic examination led to a better understanding of the position of the viscera and of its condition. With appropriate treatment to meet the physical conditions the patient was greatly improved, the auto-intoxication eliminated, constipation controlled, flatulence and pyrosis cured.

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CASE VI.—Neurasthenia proved to be a case of incipient tuberculosis. A school teacher, who had developed what was regarded as a typical case of neurasthenia based on the etiology of overwork; repeated examination by competent clinicians failed to reveal any pathology other than that which is usually encountered in neurasthenics. She was advised to utilize the approaching vacation by going to the country, eliminate all thoughts of her work, rest with high nourishment and to follow a graduated plan of increasing exercises. Two months of the summer passed without appreciable improvement and her fatigue completely discouraged her. As a last resort an X-ray examination of the chest was recommended and the typical signs of incipient tuberculous infiltration were shown. Appropriate modification of treatment has greatly improved the condition of the patient but the ultimate result is not yet determinable.

CASE VII.—Nephrolithiasis (reported through the courtesy of Dr. Van Allen). A young woman, aged thirty years, who had pain in the right side of abdomen which was diagnosed as appendicitis and an appendectomy was performed. The pain continued. Two years later she consulted a surgeon who diagnosed the pain as to her ovary and he performed an hysterectomy and double oophorectomy. The pain continued and five years later while dancing she had a paroxysm of pain and on advice of friends she consulted Dr. Van Allen of Springfield, Mass., who made a radiographic examination of the urinary tract and showed this large stone which was removed at operation and the symptoms have never recurred.

CASE VIII.—Inability to walk on account of pain in feet and legs which was first thought to be due to pronated feet and fallen arches but later was considered to have a large element of neurasthenia because the patient could stand on the feet without inconvenience, his symptoms did not develop except after walking, when he would have to stop and rest. Certain features of litigation lent color to the diagnosis of neurasthenia. After resting a short time he could walk in comfort for about the same distance he had before, when he would again have to stop and rest. Arch supports did not re-

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lieve this symptom and foot exercises for strengthening the arch aggravated the condition. His symptoms increased so that he could only walk one block at a time when he would have to sit down on the curb and rest. He was a large, well-nourished and strong man, aged forty years, and his condition received little sympathy until an X-ray examination showed the existence of arterio-sclerosis in the arteries of the feet and proved the case to be one of intermittent claudication.

CASE IX.—Pain, limitation of motion and tenderness of the wrist, considered to be a neurosis or neuritis until skiagraphic examination showed a condition of tuberculosis of the wrist. A man, aged thirty-seven years who gradually developed a painful wrist which did not get better under local treatment of liniments and counter-irritants. The tenderness troubled the patient for about six months without causing him serious inconvenience and by favoring the affected hand he was able to carry on his usual vocation of glove maker. He finally decided to consult a surgeon of prominence who practiced in a city at a distance from the patient's home. This surgeon examined the wrist by the usual methods, concluding by looking at both the patient's wrists with a fluoroscope and pronouncing the sore wrist to be "strained" (or an occupation neurosis) prescribed painting with iodine. This line of treatment gave the patient no relief, the condition gradually grew worse and a sinus presented. The patient then consulted a surgeon nearer home who advised that an X-ray examination be made by skiagraph, when a typical condition of tuberculosis of the bones was shown. The patient eventually had to have the hand amputated. This case emphasizes the fallacy of trusting to fluoroscopy for diagnosis.

CASE X.—Neurosis proved to be a case of dislocation of the symphysis pubis (sympholysthesis). Male aged forty-five years received a crushing injury and was taken to the hospital; complained of pain in his left hip and had great difficulty in urinating so that he had to be catheterized. Urinary examination negative. X-ray examination of the hip ordered by the attending surgeon and radiograph of the hip made in the hospital X-ray department. Hip shown to be normal. Patient

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after having been confined to his bed for several weeks during which time he recovered from his contusions, was urged to get up and walk about the ward. Patient seemed to experience considerable difficulty in walking—and while he was a large man before his accident, he increased in weight very considerably while lying in bed with the proportionate lack of consideration that attaches itself to this class of cases on hospital wards when they come to be regarded as chronic neurasthenics. The patient after much urging became able to walk some and was discharged from the hospital as improved, only to be admitted to another hospital in the same city. Here the attending surgeon ordered a skiagraphic examination of the entire pelvis to be made. This showed the left half of the symphysis pubis displaced about 10 cm. to the left and 1.5 cm. above its fellow. The curved line indicates the position of the compression blend when the first skiagraph was made and explains why the dislocation was overlooked.

CASE XI.—The final case is one in which the secondary broncho-pneumonia was recognized but the primary foreign body was overlooked until the Roentgenogram disproved the doctor's opinions and justified the mother's suspicions that her child had swallowed one of her hat pins. The child was twenty months old and the hat pin 6⅝ inches long. The hat pin was removed by operation and the child made a complete recovery.

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IMPORTANCE OF DENTAL DEFECTS AS FACTORS IN THE ETIOLOGY OF IDIOPATHIC EPILEPSY.

BY HENRY K. PANCOAST, M. D.
Professor of Roentgenology, University of Pennsylvania, Philadelphia.

In presenting this paper, the author desires, at the start, to offer apologies for at least two possible indiscretions, the first of which is the presentation of the subject in a comparatively unfinished state as to preparation and comprehensive detail, and the second, the discussion of a subject that in itself is by no means new, and without the introduction of any important facts not already well known. Defective dentition as an etiological factor in connection with idiopathic epilepsy was recognized long before X-rays were discovered, and this particular phase of dental radiography is one to which Roentgenologists need no introduction. Without any original investigations to exploit, or newly discovered facts to proclaim in connection with the subject, the important object in discussing it is to call attention to the importance of including a careful examination of the teeth as a part of the general routine examinations of the heads of *all* cases of idiopathic epilepsy, in order that we may not overlook any known or unrecognized dental defects that may exist and be possible active or merely contributory factors in the causation of the condition. In many of these cases that we are called upon to examine, existing dental defects have been previously recognized clinically, and the requests have been made to include the teeth in the X-ray examinations of the heads of the patients. But as long as defective dentition is a recognized etiological factor in this condition, and as we all know that dental defects are frequently found by the radiographer when they are not manifest clinically, as has been so indisputably demonstrated by Dr. Upson, for example, in connection with his investigations along somewhat similar lines, it behooves us to be on the lookout always for just such unexpected and infrequent but important discoveries.

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The percentage of cases in which radiographic head examinations have revealed any possible and tangible intracranial cause for the condition has been, unfortunately, small, and if we are able to add in any way to the value of such examinations, we shall, perhaps, be able to make them seem more worth while to the neurologist and physician than they appear to be in general at the present time.

In illustration of the importance of the procedure herein advocated, three cases are cited in which X-ray examinations of the teeth revealed dental conditions that could be regarded as possible factors in the etiology of the epileptic attacks. In each instance the examination was suggested by the author. These cases are not cited as any direct proof that some connection existed between the dental conditions and the epileptic attacks, because of insufficient time having elapsed to render any one of them an example of incontrovertible evidence in support of such an opinion.

Though the importance of such a routine examination has no doubt been well recognized by a great many Roentgenologists, still there are some of us to whom it has not been apparent, and in fact, it was first brought strongly to the attention of the author through certain observations made in connection with the first case cited.

CASE I.—Male, aged twenty-two, referred for examination of head to determine any possible cause for the condition of idiopathic epilepsy. Typical attacks began about the age of fourteen, or eight years ago, and have gradually increased in frequency to about two seizures per week. The family history presents a strong neurotic element, though otherwise negative in this connection, and the patient's home surroundings have been such that neurotic tendencies have constantly been under his notice. Although he had numerous falls during childhood, none of them were out of the ordinary for boys in general, and none of sufficient severity to produce concussion or lead to the suspicion of a fracture of the skull. A general examination of the head was requested, and was made May 3, 1911, although the physician and family had been advised that it promised little or nothing. No attention was directed to any possible

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dental defects, nor had a dentist ever laid any particular stress upon the existence of such conditions. The lateral stereoscopic examination revealed nothing abnormal in connection with the cranium, but several impacted teeth were readily detected, and with so many defects in evidence, a further careful examination of the patient's jaws was strongly urged, and was permitted, and as a result, five impacted teeth were found—all four of the third molars and the upper second bicuspid on the right side, and in addition, there was found evidence of possible abscesses at the roots of a lower molar.

Although the absence of these teeth was quite apparent to any one, the dentist can be excused for disregarding their failure to erupt, or at least that of the bicuspid, only by the fact that the patient had never complained of any discomfort referable to either impaction of these teeth or of the possible abscess. As practically everything else had been done for the patient, his physician was advised to place him in the hands of an oral surgeon, which was followed out, and early in June the five impacted teeth were extracted. The condition was somewhat worse immediately after the operation, but seemed noticeably better during July and the first part of August, when his usual attack of hay-fever began. He then went away to the mountains, and has not yet returned, but his attendant reports that the condition seemed aggravated still, although this has always been noted during the hay-fever period.

Although it is, perhaps, too soon to give up all hope in this case, still it is hardly likely that the removal of the dental defects will have much, if any, influence upon the patient's condition. The operation would seem a wise procedure in this case, under the circumstances, but in view of the neurotic element in the family and the long duration of the condition, we could hardly expect the removal of a single contributing cause to do very much good, even were the dental defects undeniably responsible directly or indirectly in causing the epileptic attacks.

CASE II.—Female, aged twelve. Family history has no direct bearing on the condition. At age of two years she had two convulsions during the period of a sick spell lasting a few

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days, and while she was cutting some of her teeth. She had no further trouble of the kind until the summer of 1910 (eleven years of age), when she was said to have had a general epileptic convulsion while visiting away from her mother. In January, 1911, her mother noticed that she seemed very nervous and irritable during the time that she complained that her right lower jaw was sore and it was noted that the first cusp of her right lower second molar (permanent) was appearing. Noticing that she appeared and acted just as she did at the time of the convulsions in infancy, her mother kept her in bed and on a restricted diet for about a week, and gave a dose of bromide when she seemed the worst, and the nervousness disappeared without any convulsion. In April, she had a typical general convulsion during the time of the appearance of a second cusp of the same tooth. The following month she had still another attack, subsequent to which, on being consulted, I advised a careful examination of the teeth, as there seemed to be an undoubted connection between these attacks and the attempted eruption of this second one of the permanent second molars to appear.

The X-ray examination revealed the following:

Right side—Lower second molar erupted but crowding the teeth in front. Upper second molar, and permanent second bicuspid and cuspid impacted.

Left side—Upper and lower second molars and upper second bicuspid impacted. I sent her to Dr. Cryer, who extracted the two upper temporary second bicuspids and freely lanced the gums over all of the second molars.

She had another convulsion July 9th, after the gum had grown over part of the crown of the lower right second molar. This was again lanced and the operation has been repeated twice a week ever since and this tooth is now fully erupted and has given no further trouble. On the 8th of this month (September) she had another convulsion, and this time complained of soreness in the left upper jaw, which seemed to be due to the attempted eruption of the second molar there. She had the gum over it lanced on the 14th, when last seen,

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and this procedure will be continued until the tooth is fully erupted.

So far, the lower left second molar has given no trouble, but from the appearance of the radiograph just made, it is likely to in the near future. After the extraction of the temporary bicuspids, the permanent ones had apparently no trouble in erupting.

This case can hardly be regarded as one of idiopathic epilepsy, but in view of the fact that an intelligent mother was quick to recognize some possible connection between the discomfort attending the eruption of some of her child's teeth and the coincident attacks of general epileptic seizures, and at the same time, having for a relative a radiographer interested in this particular condition of affairs, it is not unreasonable to entertain a belief that the early recognition and correction of the existing dental defects in this child may possibly prevent a permanent continuance of the attacks. On the other hand, given a similar case in which the eruption of the teeth was not attended by much if any discomfort, or not enough to draw attention to them, it is not unreasonable to believe that an idiopathic epilepsy originating at such a period might readily have been started by just such a cause.

CASE III.—Male, aged twenty-three. Family and previous history apparently negative. The first general epileptic convulsion was noted about February, 1910, although he probably had attacks previous to this time, because for a while before, he awoke in the mornings occasionally complaining of a sore tongue, which would be red and swollen. The attacks continued at irregular intervals, occurring once in every week or two, but never further apart than six weeks. His physician, knowing of the case just reported, brought him to me June 15th, this year, for a similar examination. In the left upper jaw, what was thought to be a portion of a root was found to be an undeveloped second molar. The appearance of the upper second bicuspid did not seem right, and suggested an insufficient filling and possible perforation. In the right lower jaw was found evidence suggesting abscesses at the root of the first molar. These conditions had never given the patient

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any discomfort that he could remember, but he was advised to have the rudimentary tooth extracted and the roots of the other two opened and examined. The former was done the latter part of June, and the latter about the middle of July. On August 2nd, his mother reported that she had watched at his bedside every night since the rudimentary molar was extracted, and that not only had he had no further attacks since then, but none for [illegible] dom at any time. His dentist has just reported to me by phone that he has had no more attacks up to the present time (September 15th), or a period of seventeen weeks, to his knowledge. The dentist also reported that when he first took care of the patient he found pulp remaining in the canals of both of the other teeth when he came to fill them, and that it was in an "inflammatory condition," but he found no pus. After treating the canals, he put in temporary fillings, which were not disturbed, as long as the teeth did not seem to give the patient any further trouble. After the X-ray examination, however, he felt convinced that it would be wise to open the canals again. This he did, and again found what he termed "an inflammatory condition" but no pus. After cleaning out the canals and treating them thoroughly, the teeth were filled, and have given no trouble since.

Although there would seem to be some connection between the dental defects and the epilepsy in this case, still sufficient time has not elapsed to give adequate support to a positive assertion that such a connection existed. The case is important for the reasons that in the first place the dental conditions were detected early in the history of the epileptic condition and when more good would be likely to result from the correction of the former; and secondly, the dental conditions were of such a character as not to have given rise to any discomfort, and aside from the presence of the tip of the rudimentary molar there was nothing to point to anything abnormal from the clinical standpoint.

In conclusion it may be said first, that as long as defective dentition is recognized as a factor in the etiology of idiopathic epilepsy in a certain small percentage of cases at least, and

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as such defects may exist without any clinical manifestations, it is advisable to include as a part of the routine head examinations of all such cases a careful examination of the teeth, whether this be requested or not.

Such examinations are most important in children, because there is, perhaps, more likelihood then of finding defects in dentition, and this represents an earlier period in the history of the epileptic condition.

Correction of defects must of necessity be done early in order to do any good, as they are usually, perhaps, only a contributing factor in the etiology of the condition. Moreover, in view of the latter fact, there should be no relaxation in the vigorous application of any other therapeutic measures that have been practiced or may be in any way indicated.

This question should be given a prominent place before the attention of the dental profession in order that dentists may always be on the lookout for obscure as well as apparent dental defects in children, who may develop epilepsy later, as well as in those of their patients who may already suffer from this unfortunate condition.

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LABORATORY NOTES.

BY DAVID R. BOWEN, M. D., PHILADELPHIA.

A NEW DARK-ROOM SYSTEM.

Two pieces of plate glass of suitable size, say 13x17 inches (for 10x12 plates) are cemented and clamped to strips of pure rubber packing so as to make a tank 12x5⅝ inches, inside measure, and 16½ inches deep. The sides of the tank will thus be of glass while the bottom and ends will be of rubber.

So far the apparatus does not differ in any essential point from that described by Weber (Munch. Med. Woch. Aug. 9, 1910), though I believe that the substitution of rubber packing for rubber tubing is a decided improvement both as to stability and durability. For each size of plates are provided nickel-plated brass holders, simply open grooved carriers into which the plate is inserted from the top and each provided with a wire handle or bale.

The tank is held stationary and the plate, in its metal carrier, is given a constant swinging upward and downward motion by means of a pivoted L, several of which may be attached to the plunger rod of a reciprocating water motor. In this way any desired number of tanks may be operated as shown in accompanying plan. The advantages claimed are that:

(A) The red light being placed behind the tank, the process of development may be observed as desired by transillumination.

(B) The quantity of developer used is smaller and the oxidation by air contact is reduced to the minimum.

(C) The plate is carried through the whole process from developer to drying rack in the metal holder, thus avoiding finger marks, cut fingers, specially partitioned hypo and wash tanks, etc.

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(D) The upright position of the plate and the irregular motion eliminate developer markings.

The apparatus as I have it was made by a small mechanic who does all his work by hand. Accepting his charges as a basis, I estimate the cost of an outfit, consisting of four tanks, sixteen plate-holders, and the motor, at from fifty to sixty dollars.

A POSTURING DEVICE FOR THE LOWER EXTREMITY.

In a variety of examinations of the hip, knee and foot, the proper degree of rotation is highly important, especially so if the two are to be taken for comparison. Such rotation can usually be maintained by fixation of the foot which I accomplish by my device. The upright, a board as long as the width of the table, is six inches high and has a slot parallel to the table. This upright is fastened to the base by hinges. Adjustable to it by means of thumb screws moving in the slot are four blocks 6x3x1 inches. These may be fastened in any desired position and the foot held between them in any desired degree of rotation.

A SIMPLE AND INEXPENSIVE COMPRESSION BAND.

The compression band consists of a web trunk-strap with a compression buckle and an insert of awning cloth. The cost was a few pennies more than a dollar, the largest item being the charge of the harness-maker for work.

Considerable time was wasted in the mistaken idea that a material selvedged on both edges was necessary. This awning cloth shows practically no tendency to ravel and, if it ever does, its replacement is easy. The band is practical in any size up to six inches, or two or more of them may be used side by side. It may be preferable also with some tables to have the strap hook to the sides of the table rather than to pass around under it as this one is designed to do. Care should be taken to select a buckle that not only has a sure grip but which may be readily loosened.

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A SMALL STEREOSCOPIC PLATE-CHANGER, ESPECIALLY ADAPTED FOR THE ELBOW WHEN PUT UP IN THE ACUTELY FLEXED POSITION.

In perhaps no class of fractures is the surgeon more anxious to have his work reviewed by the X-ray than in those of the elbow joint. With the acutely flexed position, the forearm bandaged to the body, the two-position radiograph is clearly impossible.

Stereo exposures through the body are not satisfactory. To meet this difficulty I designed the plate-changer shown here. The mechanical difficulties of soldering aluminum were avoided by folding the aluminum top to the brass bottom over a suitable form. Its extreme thinness allows it to be slipped up under the elbow almost as readily as a single plate. I have considered a larger carrier for more general use in which the two holders would be placed back to back and fastened together. This double holder could, very quickly, be withdrawn, turned over and reinserted.

The considerable increase in the thickness of the tunnel would, however, render it less desirable for the elbow work.

PHOTOGRAPHY FOR THE ROENTGENOLOGIST.

Practically all of the photography needed to prepare illustrations of patients or apparatus can be done with simple apparatus in the office much more satisfactorily than to send it out.

For all still work, apparatus, views of patients not including the face or thorax, etc., magnesium ribbon gives the ideal light, because it is nearly smokeless and because a very little experience will enable one to gauge accurately, by the length of ribbon used, the required exposure. With the same conditions as to the room, distance, etc., the same results may be obtained time after time with almost mechanical accuracy. The tendency of the ribbon to unwind and tangle gave me some trouble until I adopted the plan of winding it on a small fish-reel using a small metal clasp for the loose end. This also serves for the handle from which the ribbon is burned.

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For photographs including the face, the flash powder with a lamp, the ignition of which may be controlled by a hand bulb, is needed. The exposure may be made in a fairly lighted room, certainly not a darkened one. Use a lens cap instead of the shutter that the patient may not start at the shutter click. With a drop light or candle try the lighting from various angles until a satisfactory point is found and place the flash lamp at that point, which must not be in front of the camera.

Everything being ready, the cap is removed from the lens and the moment of exposure chosen as deliberately as you please. The lens may remain open from one to five minutes according to the lighting of the room without injury to the photographic plate.

Any 4x5 camera with a good rectilinear lens will give good results. When fine details are needed, focus upon a candle or other light held in the plane with the subject, with the lens wide open. Stop down to F. 16 or smaller before exposure.

As with the magnesium ribbon, so the flash exposure may be accurately gauged by measuring the powder carefully.

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THE VARIABILITY OF THE FOCUS POINT OF THE X-RAY TUBE AND A SIMPLE MEANS OF SELECTING A PICTURE TUBE.

BY GEORGE E. PFAHLER, M. D.
Clinical Professor of Roentgenology in the Medico-Chirurgical College, Philadelphia, Pa.

Every experienced Roentgenologist recognizes that the most important part of his apparatus is a good tube. We all recognize too that comparatively few of the tubes sent to us are really good "picture tubes." In the past we have had to exclude the bad tubes by producing a series of poor negatives, and after eliminating all other possible errors conclude that the fault is in the tube. Such knowledge is usually obtained at the expense of much material, and at times with the embarrassment of having made a faulty diagnosis.

Walter, Willey, Caldwell and others called attention to the various factors that enter into the production of a good tube, and to some of the causes of faulty tubes. In this brief paper it is not my purpose to enter into a discussion of the production of a good tube, nor to explain the factors which produce a faulty tube. I simply wish to record what I believe to be an original observation of the *movement of the focus point in an X-ray tube, during an exposure of a half second, without variation in the current strength or in the vacuum*, and that this occurs in some tubes more than in others, but that none are perfect.

In some tubes the variability of this focus point is so great as to make them worthless as "picture tubes." In such instance a fracture of a bone may be overlooked and a foreign body not be demonstrated. Tube No. 68, Fig. 10, was one of these extreme types, and yet when observed in my office by two leading Roentgenologists, who were judging the tube by its fluorescence and penetration, they said, "That is a fine tube." In the illustration, Fig. 10, which was a picture made with this tube, you will see that all shadow lines are practi-

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cally obliterated. In order to test its actual picture value, I placed two cross-pins upon the thigh of one of my assistants and made a plate. The shadow of the pin which lay in the direction of the longitudinal axis of the tube is obliterated, while the one lying transversely to the longitudinal axis is but faintly shown. This picture as a whole is poor in photographic effect and lacking in detail.

In this tube, the focal point moved in all directions, but more in the transverse than the longitudinal. For this reason the longitudinal pin is obliterated while the transverse is faintly shown.

In most of the tubes, in which the focal point is distinctly variable, it moves more in the transverse than the longitudinal, while in a few there is practically no movement in the transverse, but distinct movement in the longitudinal direction.

I find this variation in all makes of tubes; I do not know the cause. To all appearances, and judged by the fluorescence and by the size of the "burned point" on the target, the tubes may be identical, yet when put to the test there is great variation.

The tubes which show very little variation in the focal point make fine "picture tubes," and I find that they remain good "picture tubes" from the beginning until some accident happens to them.

I have made observation on over two hundred tubes, but have photographic records of the last sixty. I find a good "picture tube" in one out of four or five. I reserve the "picture tube" for diagnostic work, and find the others satisfactory for treatment. There is, of course, no objection to the variability of the focus for treatment.

TECHNIQUE OF THE TEST.

Fluoroscopic Method—Take a compression cylinder; stretch across the upper aperture two lead wires or bands, such as fuse wire, one wire corresponding to the longitudinal axis of the tube and the second crossing at right angles; place the fluorescent screen beneath the cylinder; then in a dark

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room excite the tube until it takes the amount of current that the operator customarily uses in making exposures. The shadow of the wires will be thrown upon the screen, with some tubes sharply, with others very dimly. One can often see the shadow of the wires move a half inch (with the screen 18 inches and the cross wires 4 inches from the target of the tube) without varying the current, and without any apparent variation in the vacuum. Such a tube will, of course, not make any satisfactory picture.

A good tube, on the other hand, will give sharp cross lines and one can see no movement. Such a tube will make excellent pictures.

The Photographic Method—Just as a photograph will record more than the eye can see in other matters, so it will record finer variations than can be shown fluoroscopically. The same cross lines can be used, but I believe heavy wire large (⅛ to ¼) mesh is better. I usually test four tubes at one time, using ¼ of an 8x10 inch plate for each tube. This allows me to make good comparison and select the best tube. I make each exposure exactly the same length, timing it automatically. I use a comparatively slow plate, and time it exactly one-half second.

I always set my rheostat exactly the same and always use exactly the same amount of primary current—the amount that I usually use in making pictures. I then record the amount of milliamperage that will flow through each particular tube with this definite quantity of primary current and also the vacuum of the tube as measured by the Benoist Scale.

In this way I learn which tube has the most stable focus point, which has the highest penetration with the least resistance, and which gives the most photographic effect.

Fortunately the three effects generally, but no always, go together. It might be inferred that the stability of the focus point depended upon the vacuum, but this is not true. It might also be inferred that a low tube would have a more stable focus, but neither the low nor the high are likely to be stable. In fact, I believe that the stability of the focus has no

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connection with the vacuum, although most of the good tubes register about Benoist 6. On the other hand, many tubes may register Benoist 6 and still be miserable tubes.

I have been especially impressed with the striking variation in so short a period of time. I noted it even in my highest priced imported tube to a moderate degree, even with an exposure almost instantaneous, the exposure being made with an automatic magnetic switch which broke the current the instant the main switch was closed.

Since one gets this variation in even an instantaneous exposure, it is easy to understand that the selection of a proper tube is of as great or greater importance than great speed in Roentgenography, for it matters little whether the patient moves or whether the focus of the tube moves, either producing a lack of sharpness of outline.

This may seem like a little thing to write up, but I can say that no single point in technique has been so helpful to me.

CONCLUSIONS.

1. The focus point of a tube is distinctly movable in nearly all tubes, but it is practically negligible in a selected few.

2. This variation can occur in a momentary or almost instantaneous flash.

3. It is the cause unknowingly, at times, of poor detail in plates.

4. "Picture tubes," with a focus point that is practically stationary can be selected both fluoroscopically and photographically.

5. If these tests were made by manufacturers, they would probably learn to make more uniformly good tubes.

POINTS OF INTEREST IN THE ILLUSTRATIONS.

Fig. 1. Good picture tube (a six-inch bulb) shows practically no movement of the focal point. 45 m. a., one-half second 18 inches, Benoist 6. See small fragment of netting on the plate.

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Fig. 2. Poor tube (six-inch bulb). See the double transverse lines and fairly sharp vertical lines, showing that the focus moved only in the direction of the long axis of the tube. Benoist 6; 35 m. a.

Fig. 3. A good tube showing slight movement of the focal point in the longitudinal direction. Benoist 6; 45 m. a.

Fig. 4. A good tube (six-inch tube). Benoist 5; 60 m. a.

Fig. 5. A very poor tube (six-inch tube) showing movement of the focal point in both directions, but more in the transverse. Benoist 6; 40 m. a.

Fig. 6. Good tube (six-inch bulb). Benoist 6; 45 m. a.

Fig. 7. A very poor tube (eight-inch bulb) showing movement of the focal point in all directions. Benoist 6; 45 m. a.

Fig. 8. A poor tube (six-inch bulb). See the double transverse lines indicating movement of the focal point in the longitudinal direction. Benoist 7; 35 m. a.

Fig. 9. Very good tube (six-inch bulb) showing a slight movement. Benoist 6; 40 m. a.

Fig. 10. A very poor tube (seven-inch bulb). Notice that the shadows of the fuse wire are practically obliterated.

Fig. 11. A poor tube (seven-inch bulb). Benoist 5; 35 m. a.

Fig. 12. A very good tube. Benoist 5; 45 m. a.

In all tests the focal point was 18 inches from the plate, and in each instance the tube was first tested until it would take the full current smoothly.

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THE IMPORTANCE OF THE PROPER UNDERSTANDING OF THE RELATION OF THE ABDOMINAL VISCERA IN THE TREATMENT OF AUTOINTOXICATION AND AUTOINFECTION.

BY DR. JOEL E. GOLDTHWAIT, BOSTON, MASS.

The advent of the Roentgen ray set me thinking, and made me realize that while certain things had been met with often before, we had failed to recognize them, and that the Roentgen ray would in all probability help us to discover them and give these patients some relief at least.

My work has to do almost entirely with chronic medicine, and while bone and joint lesions represent perhaps the majority of conditions, how many paralyses come to the orthopedist sooner or later to get his opinion. My attitude toward the progressive paralyses has come to be much the same as my attitude toward rheumatism or tuberculous joint diseases; that there is some way out for these patients, and we must find that way. If we can find it, there is some satisfaction in our work which does not consist in putting on braces and giving exercises, which may help temporarily, but shortly cease to be of assistance.

My plea to you is that you study these cases as they come to you, and try to show in the plate all there is to show, because many times plates are seen where there are shown things that are as plain as the a-b-c, and yet the proper interpretation is missed by the medical profession, and even by the Roentgenologist. In other words, I am perfectly sure that if we will try not only to see what the Roentgen ray shows but the relation of what is shown to the general health of the individual, you will improve vastly the specialty in which you are all interested and widen the scope beyond that of mere technical value.

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I have a series of plates which will show my feelings in regard to those conditions. In the first place, in the chest and abdomen we have the important viscera of the body, all except the brain, and the proper relation of these viscera, one to the other, determines health or determines disease. The Roentgen ray is of the greatest assistance in determining not only diseased conditions of these organs, but the position of these organs, and not only the position of the particular organ which may be shown in the Roentgenogram, but the necessary result which must accrue to some other organ because of the position which the organ shown on the plate may have. And it is quite as much that which is not shown, but which we must see by reason and intelligence, that is often of the greatest value in the plate itself.

If the organs of the body are in correct relation to one another, the normal functions go on without interference; if, on the other hand, one organ is out of place, it is not only the one organ that is out of place, because all organs have distinct relations one to the others. The organ which is out of place may not suffer, but it may push some other organ out of place and make that organ suffer very materially. The thoracic organs may crowd and modify by change of posture the abdominal viscera which are more easily affected, because in place of the rigid thoracic wall you have simply a soft muscular wall behind which are more organs than in the thorax, organs which are much more mobile in anatomic relation and in which you have not only the organ itself, but in which you place the food products and material which have a distinct relation to health and the function of the individual part. Remember that one out of every five persons is born without normal supports of the abdominal organs. In the process of evolution the quadruped has a free attachment of its organs; they hang freely from the backbone, and there is no interference one with the other; everything is hanging from one line. When you make the quadruped a biped, you change the relation of these organs, and Nature provided that these organs should have a certain relationship to one another. The scheme of development is a definite one, and differs for each

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kind of animal only in the degree of progress that is made. The human is the last stage; the fish and bird stage come early; the changes which determine the human from the quadruped come later, and since that is the last stage it is the one which fails most often, and that is why one out of every five persons is born a quadruped.

That necessarily does not do any harm in itself so far as causing disease is concerned, and that is one of the first things I want to emphasize.

There has been a great deal of misunderstanding in that the Roentgen ray may show an extreme degree of ptosis of some organ, or a malposition, and yet that may not be of any special importance as a cause of disease.

A patient came to me with back pains. She was out of poise; she had a sacroiliac strain because she was standing out of poise, and there was a visceral strain in front which was dragging her forward. If a person's viscera are hung from the diaphragm in the back, it leads to a droop posture, which this patient had. This patient had symptoms coming from this. The stomach was found to be down in the pelvis. To unload that stomach she had to get the waste to a higher level so as to pass on into the duodenum, and she retained her food for a longer time than was necessary, unless she assumed a certain posture. Her colon was practically below the crest of the ileum. That can only happen when there is a free mesentery on the ascending and descending colon. That woman had the visceral support of a quadruped and not of the human species. She got rid of the waste all right so that she did not suffer from autointoxication.

In these cases we must not simply see a prolapsed stomach or colon, but the general prolapse which is present. It is not simply the stomach and colon, but there is also a loose liver and loose kidneys. All the organs are free and loose. There is a mobile kidney.

In all of these cases there is no retroperitoneal fat. It either never was present or else it has been absorbed. There is no shelf for the kidney, and it is free and loose. To sew up the stomach is not enough to give relief in these cases.

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There are certain ear-marks shown by these patients so that you can recognize the existence of this condition at sight, but you cannot tell the degree of malposition.

In another case the stomach was almost in its normal position. The waste was passed on into the duodenum comparatively easily. The second picture taken of that patient was of interest. The patient had a hypertrophic arthritis of his hip. That man had an acquired ptosis of the hepatic angle of the colon as the result of posture. If a person drops forward the ribs are pushed back; that pushes the stomach and liver back and down, and the hepatic flexure of the colon comes under the liver, and you get what this man had. The waste got into the ascending colon all right, but it was held back at the hepatic flexure and it was very slow in going through the colon.

Another man had a stomach not much lower than normal, as many individuals have and it need not necessarily cause any inconvenience; but when taken in connection with a series of pictures that was made it is of significance. In six hours the food left the stomach and small intestine and was in the ascending colon and first part of the transverse colon. Two hours later some of the liquid has been absorbed, but the waste has not traveled any farther. Three hours later, or eleven hours after the ingestion of the meal, the waste is still in the same position, stopping, as before, near the splenic flexure. Twenty-four hours after the first picture was taken, some of the waste is seen in the splenic flexure, where it should be, under the ribs. But whatever has got there is seen to be in scybalous masses; the bulk of the waste is still in the ascending colon and first portion of the transverse colon. That means that there is something wrong. For eighteen hours the waste has failed to move.

The next case I studied was that of a child. That shows that this condition is congenital as well as acquired. The child was six years old; all crippled up with rheumatism, a condition which was present since the child was a year and a half old. The child then had dysentery, and after that gradually developed rheumatism. The stomach was way down

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at the ileum. Of course, that was not the maximum amount of sag, but we can not change the condition of a child born with little support for its viscera. That child could live well as a quadruped. It would not have any symptoms, but as it is, the condition will go from bad to worse.

A second picture was taken an hour and a half after the first. The stomach is seen to be unloading itself and most of the food is down in the small intestine. It is going through pretty well. In the third picture, taken three hours and fifteen minutes after the first, the stomach is seen to have unloaded itself; the small intestine has completed its work, and the food is in the colon. The ascending colon is down almost below the crest of the ileum; the transverse colon has sagged, but the descending colon is in its normal position. Here Nature's plan has partly worked out. That child is partly human and partly quadruped. There is a freer attachment for the stomach than there should be; the ascending colon is way out of place; the descending colon is in normal position. There is a dragging here all the time, so that the food and waste pass through the bowel with much difficulty. Here the Roentgen ray is of great value in determining the conditions present.

In the work we have been carrying almost every combination has been found, a firmly attached ascending colon with a free descending colon. The ascending colon in one case was free, except for about two inches in its middle, and the upper part was folded over that and in the sigmoid was a great deal of gas. There are all sorts of combinations, but with the same fundamental trouble behind them all.

In six hours the liquids have been absorbed and the waste is worked together into a bolus. You can see plainly the gas areas in all the pictures taken of this child. In eighteen hours almost all of the waste has been passed through and it is out of the body in that time. But the thing that is striking is that in this ascending colon is still present a part of the bismuth meal. A patient may have a regular movement of the bowels, and yet in the pockets and pouches formed where the colon has been blown up and distended there are masses

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of fecal matter so firmly caked on the side that a blunt dissector is needed to loosen them.

That is what the Roentgen ray will demonstrate to you in these cases. It will show you what is present and also tell you what must be done to establish normal anatomic conditions, and until you correct these misplacements and malpositions, you can work from now until doomsday and not relieve these patients from their distressing symptoms.

In another case, a stomach large and distended was far down below the crest of the ileum. Usually the stomach is on the left side, but in this case it was on the right side. There was a free mesentery on the ascending colon, but the splenic flexure was in position. If the colon is in place, the stomach can not get out of place; the ascending and transverse colon is the natural ligament of the stomach. In this case, six hours afterward the stomach and small intestine had unloaded themselves; in twelve hours the liquid was absorbed, but the ascending colon was filled with waste, and little of it is seen in the transverse colon. In twenty-four hours most of the material has worked it way uphill, but some of it is still seen in the transverse colon and ascending colon. You can tell at once the rapidity with which the organs are working. In the case of the individual with the hypertrophic form of arthritis the question was what was making his organs work wrongly. Six hours after the ingestion of food there is still a lot of it in the stomach.

These things mean something more than just a picture with a shadow on it, and the thing we must do is to put our minds to work and take a series of pictures. If one picture does not show everything, take another, and study that until you know what the relation of the viscera is. Then stop and think of what the effect must be on the other viscera, and you will explain a lot of things now only partly understood.

It is easy, for instance, to diagnose gall-stones and remove them. But what has caused their formation? In many of these cases you will find mechanical displacements which easily cause a kink, and which causes all the symptoms. You can not relieve these patients until you get those viscera to work

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right. The same is true of a loose kidney. Many of these patients can be benefited by the help which you get from the Roentgen ray and with proper training and study you can hold these organs in place. The treatment must be checked up with the Roentgen ray until you get the desired result. These patients must be nourished until you can see the retroperitoneal fat which they all lack. You can not keep these organs up in place when the chest is narrow or the body is compressed by the corset. You must make it possible to have the ribs flare so that these organs can stay in place.

The type of cases in which you have congenital ptosis is perfectly definite and you can recognize them at sight. These individuals lack poise and correct posture. The posture is the result of the ptosis. The Roentgen ray will show you and the patient just what is the trouble, and it indicates the treatment which must be pursued.

In normal cases with the viscera supported properly you have good nutrition. A heavy person, for instance, flops down and the ribs drop in, pushing the liver and stomach downward, which may interfere with the colon and many other things. That condition is not congenital; it is acquired and causes quite as much disturbance as the cases in which there is a complete ptosis with absolutely free attachment of all the viscera.

That is the point to remember, and that is one of the chief things we must impress on the surgeon and physician. True, all the people who have these conditions are not sick, but, remember that one out of every five individuals is born with his organs out of place; but there is the functional condition, and it may cause trouble at any time.

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ROENTGENOGRAPHIC DIAGNOSIS OF URETERAL KINKS CAUSING INTERMITTENT HYDRONEPHROSIS.

BY G. H. STOVER, M. D., DENVER, COLORADO.

While the Roentgenographic examination of the renal pelvis and ureter following the injection of opaque fluids such as collargol, etc., is not new, it is believed that a suggestion of Dr. O. S. Fowler, of Denver, Colo., regarding an addition to the technique of these examinations, which technique has since been made use of by the writer and Dr. Fowler in the examination of several cases, has practically developed a new method of examination and diagnosis in a very troublesome class of kidney cases.

Hydronephrosis has heretofore been recognized only in rather an advanced stage, when the dilatation of the renal pelvis is considerable; the Mayos, for instance, consider that the renal pelvis must be able to contain 50 CC. of fluid before they make a diagnosis of operable hydronephrosis; at this time the function of the kidney is markedly impaired and its structure may have received serious damage.

Many of the classically hydronephrotic cases are found at operation to accompany a movable kidney, in which there is a dilatation of the renal pelvis and in which there is also a dilatation of the ureter above the location of an aberrant artery or vein, or a band of adhesion; these patients were relieved after a fixation of the kidney and removal of the obstructing structure.

We have found, and have demonstrated by catheter tests, Roentgenograms and surgical operation that there is easily recognizable a much earlier stage of this condition, to be discovered before dilatation of the renal pelvis has taken place.

A certain number of patients complain of pain in one or both kidneys; a pain somewhat like that of the classical hydro-

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nephrosis, but not relieved by the sudden passage of a quantity of urine and a disappearance of the tumor, and without the microscopic urinary findings of fully developed hydronephrosis; a pain suggestive, but not typical of renal calculus colic, and in which Roentgenographic examination for stone is negative. The symptom complex in this class of cases has usually been rather vague in its diagnostic indications, and there have undoubtedly been many instances in which a faulty diagnosis has led to operation for conditions which were not present, the trouble being laid to an appendix, a tube, an ovary, or a gall bladder.

In the class of cases under consideration it was found by Dr. Fowler that the injection of a comparatively small amount of solution (averaging only 14 CC.) into the pelvis of the kidney, produced a pain exactly similar to the pain from which the patient suffered; an injection of the unaffected kidney produced a pain which the patient had never felt there before, but identical with that which had been felt on the other side.

We had already examined hydronephrotic cases after collargol injections, and in the course of several conferences on the subject of the Roentgenographic examination of the various viscera in which mention was made of the fact that I, as a routine, make Roentgenographic examinations of the stomach and intestines with the patient in the erect posture, Dr. Fowler suggested that in examining these cases of "intermittent hydronephrosis" the collargol be injected first with the patient reclining and a plate made, then the patient placed in the erect posture and a second plate made; while the patient is in the erect posture he is instructed to make various movements of the trunk, such as would be calculated to dislodge a really movable kidney, and at the same time the ureteral catheter is being withdrawn while a further amount of solution is being injected through it, thus showing Roentgenographically the changed position of the kidney and demonstrating the appearance of the ureteral kink; this procedure, as far as we can ascertain, has not been made use of prior to our work.

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Operation has always so far shown the kink to be due to an aberrant vessel over which the ureter loops when the kidney descends.

I take pleasure in presenting illustrations showing our Roentgenographic findings in some of the cases we have examined in this way.

Plate 1.—Mrs. H. Patient in recumbent posture. Renal pelvis opposite body of first lumbar vertebra.

Plate 2.—Mrs. H. in erect posture. Renal pelvis now lies opposite space between second and third lumbar vertebræ. Ureteral kink shown.

Plate 3.—Mrs. M. Patient in erect posture. Renal pelvis opposite space between third and fourth lumbar vertebræ. Kink in ureter shown. Operation revealed it to be due to looping of ureter over an aberrant artery of the lower pole of the kidney.

Plate 4.—Mrs. W. Patient in recumbent posture. Renal pelvis opposite body of twelfth dorsal vertebra.

Plate 5.—Mrs. W. in erect posture. Renal pelvis opposite body of third lumbar vertebra. Ureteral kink shown. Operation proved it to be due to looping of ureter over aberrant vein of lower pole of kidney. The kidney itself in this patient was hypertrophied.

Plate 6.—Miss V. G. in erect posture. Renal pelvis opposite lower portion of body of third lumbar vertebra. A curve in ureter shown. Patient not operated at time of this report.

This technique will undoubtedly prove of value in enabling us to make a diagnosis of impending hydronephrosis at so early a stage that the kidney will not have as yet sustained any structural damage.

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ROENTGENOLOGY IN OBSTETRICS.

BY P. M. HICKEY, M. D., DETROIT, MICH.

Mr. President and Members of the American Roentgen Ray Society:

The following notes are intended simply as a preliminary report, and are presented largely to elicit discussion as to the work which has been done by other members of our society. The obstetrical Roentgen Atlas published by Leopold and Leisewitz in 1909 brought together in a very beautiful way the applications of the ray to the field of obstetrics. Schoenberg in his well-known treatise, has given the results of several of his investigations upon the feasibility of showing the living fœtus.

The introduction of the new type of intensifying screen would seem to afford us new possibilities in the demonstration of the fœtus in utero. Formerly the exposures were of such length that the average operator hesitated to expose developing tissue to the long and intense radiation necessary for obtaining diagnostic plates. With the shortened exposure by the use of a screen it would seem that this former fear can now be dispelled. The cases which the writer investigated went on to a normal delivery with no apparent injury to the child. The cases which the writer investigated were undertaken simply with the idea of trying to find if the fœtus could be shown in short exposures by the screen. The patient lay upon her side, with the screen in place underneath and the large cone of the diaphragm was brought against the opposite side. The difficulty in making lantern slides of such plates as were obtained precludes the demonstration of these plates by the lantern. The transparencies, however, which were made, and which we will now pass around, show that the head can be shown with the upper and lower jaw, and the wall of the orbit as well as the fontanelles, the thoracic cage and the

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long bones. This enables us to orient in a general way the position of the fœtus, telling whether the presentation will be occipital or breech. The differential diagnosis between a single or twin pregnancy can also be made. It has not been the good fortune of the writer to have a case for the diagnosis of tubal pregnancy, but there has been a number of cases upon record.

The conclusions which the writer would present from his small number of cases would be, first, that the short exposures made possible by the intensifying screen can be carefully employed in pregnancy without hastening the termination of pregnancy and without apparent injury to the living fœtus; second, the Roentgen ray can be used in the later months of pregnancy as an aid in the diagnosis of the different positions; third, the differential diagnosis between a single and multiple pregnancy can be made with considerable assurance; fourth, for the obtaining of soft tissue differentiation the use of as low a tube as is consistent with penetration must be employed; fifth, for the safe determination of the quality of the tube the qualitometer is of the greatest assistance.

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COMPENSATING DISPLACEMENTS OF THE THORACIC VISCERA IN PULMONARY TUBERCULOSIS.

BY CHARLES LESTER LEONARD, A. M., M. D.
PHILADELPHIA.

The laws of physics render it essential that the lungs shall follow the thoracic walls and the diaphragm in their movements. This is because the lungs are distensible flaccid organs, open to the inrush of air, placed within a closed and semi-rigid bony and muscular case, which is capable of increase and decrease in its volume by muscular movements. Any alteration in the capacity of the lungs must be compensated for, or the excursion of the walls surrounding them must be decreased.

Compensation for the loss of expansion in the lungs takes place through an increase in the capacity of their normal area, or through the interposition between the visceral and parietal pleura of an area filled with air, or fluid, or both. These changes must take place in proportion to the volume of the lungs involved in a pathological process. They are in a measure appreciable by the ordinary methods of physical diagnosis. The changes which can be noted by inspection and mensuration are, however, less marked in ratio with the extent of the disease, than those within the thorax, which produce displacements or alterations in the position of the viscera.

Tuberculous disease must be far advanced or an acute pneumo-hydro- or pyo-thorax of large volume must be present before the limitation of the thoracic movements can be noted by inspection. Marked alterations in the position of the intra-thoracic viscera occur in the earlier stages of tuberculous disease, without visibly changing the excursion of the thoracic walls. These displacements occurring early in the disease have been generally overlooked. Until recently it was held that the heart and greater blood vessels were so finely attach-

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ed by ligaments to the skeleton and diaphragm that they could not be displaced except under extreme conditions. These views were apparently upheld by the post-mortem findings.

Since they have been recognized by the Roentgenologist in the living subject, it has become evident that the post-mortem changes hid the true condition. The correctness of this conclusion was shown as the result of a discussion which I had in 1909 with an internist connected with one of the largest institutions for the special study of tuberculosis. He did not believe that displacements of the viscera could occur so frequently in the earlier stages of the disease. He said that in some hundreds of post-mortems conducted at the institute they had failed to find such displacements. Some months later he told me that in the subsequent one hundred post-mortems they had found twenty-five or thirty displacements in the less advanced cases.

These pathological variations in the position of the thoracic viscera can be clearly shown only by the rapid Roentgenograms that eliminate the heart's motion. Their exact position and interthoracic relations can only be fully appreciated by the rapid stereo-roentgenogram.

The twelve cases used in illustrating the subject of this paper are taken from a series of one hundred cases studied by the rapid Roentgenogram. These cases were for the most part referred for examination from the State Dispensary for Tuberculosis through the kindness of Dr. A. P. Francine, and a part of them formed the basis of a paper read by me before the British Medical Association in 1908 (B. M. September 12, 1908). Many, however, including some of the more interesting pathological cases, were from private practice.

In the entire series of one hundred cases twenty-six displacements of the heart and aorta were found with three cases of pneumo-thorax. In seventeen cases the heart was displaced to the right; in four to the left; and in five a rotation took place with an upward displacement of the heart and aorta, so that the heart assumed an antero-posterior position. In two cases a superficial pneumo-thorax was found overlying the lower left

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lung and in one case an acute hydro-pneumo-thorax of tuberculous origin was shown.

It is practically impossible to reproduce the Roentgenogram in ordinary printing with sufficient clearness to make its interpretation valuable. The twelve cases cited as illustrations of the subject of this paper have therefore been reproduced in tracings made directly from the individual Roentgen negatives. Varying types of line drawing have been used to diagramatically represent the different stages of the pathological process. An increased number of lines in one direction represents the line of contractile force. The tracings are accurate in detail and can be more readily appreciated by the reader. The accompanying stereo-roentgenograms, if viewed through the ordinary parlor stereoscope, will show in a measure the wealth of detail which can only be fully appreciated by the study of the original negatives on the large stereoscope.

The sharp outline of the heart, seen in these plates, shows that the exposure must have been sufficiently rapid to eliminate its motion, that is, they must have been taken in a fraction of a heart's beat. The time between the stereoscopic pains, required to shift the plates and tube, was one-half second. The total time for both exposures was, therefore, less than one second.

A review of the cases, in the entire series, shows that those cases in which no displacement of the viscera was present were early lesions, in which no fibroid change had taken place, or that the lesions were not extensive and symmetrical, or that the heart was bound down by adhesions between the pericardium and the diaphragm.

The unequal elevation of the two halves of the diaphragm, Williams' sign, was present in less than one-half of all the cases, and was not present where displacements of the interthoracic viscera had occurred.

The irregularities of the diaphragm seen in the cases illustrating this paper are due to adhesions between the pulmonary and diaphragmatic pleura.

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The pathological displacements of the thoracic-viscera in pulmonary tuberculosis are the result of compensation for the destruction of expansive normal lung tissue by the disease.

The displacing force is the result of one or two changes or the combination of both, or as in the case of acute pneumothorax from the rupture of the lung. The consolidated lung area may undergo fibroid change and contraction, the contracting tissues drawing the heart and aorta with them, while the emphysematous lung on the opposite side assists in their displacement. That these two causes can act separately or together is shown in the illustrating cases. In some the heart and aorta are displaced in a direction entirely different from that of the pressure exerted by the emphysematous lungs or even where a marked emphysema is absent. Again a displacement is present and an extensive emphysema alone accounts for it.

In the surgical treatment of ordinary abscesses, evacuation and drainage are followed by compression, by the external dressing, to bring about coaptation of its walls and healing. Since external pressure can not be exerted within the thorax, the same result is achieved in the natural healing of abscess cavities in the lungs by the displacement of the viscera to produce compression.

In addition to the displacements which cause compression of the diseased portion of the lung, there is present in many cases an ossification of the costal cartilages and an approximation of the ribs over the affected area. As I have suggested in a previous paper the ossification of the cartilages may be a process of ankylosis to limit the motion of the ribs and place the parts more nearly at rest.

The compensating displacements may be divided into four groups: Displacements of the lung by superficial pneumo-thoraces; displacements of the heart upward and into an antero-posterior position; displacements of the heart and aorta to the left; and displacements of the heart or heart and aorta to the right.

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DISPLACEMENTS DUE TO PNEUMO-THORACES.

In both the cases of superficial pneumo-thorax, the physical examinations which preceded the Roentgen examination failed to detect them, but their presence was confirmed by subsequent physical examinations. In both cases the primary lesion was of the left upper lobe, with no involvement of the right lung. It is noteworthy that in none of the similar lesions of the entire series which involved the upper right lobe did a pneumo-thorax occur. The accompanying stereo-roentgenogram of Case 1 shows the lower lobe of the left lung hanging like a lace curtain within the thorax, conforming to the curve of the thoracic wall and separated from it by an area clearly devoid of all lung structure. The upper left lobe shows distinct lines of fibrosis in the infiltration, while peri-bronchial lymph nodes are seen in both lungs. A later stage of a similar lesion is shown in Case 2, but with an entire absence of peri-bronchial enlarged glands. In this case the entire left lung is involved. The cavity seen in the upper lobe shows that the older lesion was there. The lower lobe is compressed but not entirely consolidated and is covered with a distinctly thickened pleura, which can be seen in the Roentgenogram. In marked contrast to the succeeding case of acute hydro-pneumo-thorax, the heart and aorta are displaced to the left, probably entirely as the result of the compensating emphysema of the entire right lung.

The next case (3) was of particular interest, as it was an acute tuberculous hydro-pneumo-thorax. This Roentgenogram was taken with the patient in the erect position, because of the fluid, which is seen as a level line just below the seventh rib. The lung is compressed upon the mediastinum and the heart and aorta are displaced to the right. This condition was readily recognized by the physical examination, but the position of the heart and aorta were not definitely determined. In this case both the lung and the heart with the aorta are displaced to the right.

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ANTERO-POSTERIOR AND UPWARD DISPLACEMENTS.

This displacement was found in five cases of the entire series as illustrated in this paper by Tracings 4 and 5. The tuberculous lesions in all these cases were symmetrical and involved both upper lobes. The heart was not only rotated but with the aorta was drawn upward, showing that a decided force was exerted by the contracting fibrous tissue in the upper lobes. It is possible that the decreased superficial area of the heart presented to percussion in these cases, may account for an old opinion that the heart is small in tuberculous subjects. This opinion was not confirmed by the comparison between the size of the heart and the body weight of the patients in the entire series.

In Case 4 the heart is drawn up and rotated, so that as it rests upon its apex it presents a peculiar aspect as a wide band occupying the mediastinum.

In Case 5 the rotation is not so complete and the hand of mediastinal shadow is broader. In the stereo-roentgenogram of this case it will be seen that the heart lies within a very much thickened pericardium upon the left side particularly which accounts for the peculiar straight line shown as its left border. The heart, however, can be distinctly seen within the pericardial shadow. The stereoscopic picture also shows very clearly a dilated bronchus forming a cavity in the right upper lobe with the surrounding infiltration and fibroid change in both upper lobes with commencing softening and cavity formation in the left upper lobe.

In the entire series of cases the displacement of the heart to the right was four times as frequent as the left, in direct opposition to the opinion expressed by some authors. Of the greatest importance to the clinician is the fact, first demonstrated by the Roentgenologist, that the aorta is also displaced in almost every instance. It is possible in most cases to demonstrate by percussion the border of the displaced aorta that lies outside the line of the sternum, but almost impossible to show the one that lies beneath it. This fact has undoubtedly led to the diagnosis of aneurysm in many cases of displaced aorta. In

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only one case of the entire series was an aneurysm found. It was suspected from the symptoms presented but could not be demonstrated by physical examination. The Roentgenogram showed an aneurysm buried in a mass of tubercular consolidation that occupied both upper lobes and a part of the lobes below them. In contrast to this is Case 8 to be spoken of later, in which the symptoms suggesting aneurysm were found to be due to a displaced aorta.

DISPLACEMENTS OF THE HEART AND AORTA TO THE LEFT.

In addition to Case 2 of superficial pneumo-thorax where the heart and aorta are displaced to the left, this group of displacements is illustrated by Case 6. Here there is an extensive involvement of the left lung. There is a cavity with surrounding consolidation and softening in the upper lobe, while consolidation and marked fibrosis have taken place in the upper portion of the lower lobe. The heart is drawn well over to the left but the arch of the aorta is in its normal position.

DISPLACEMENTS OF THE HEART AND AORTA TO THE RIGHT.

The extent to which the heart and aorta can be displaced upward and to the right, by fibrosis and contraction of a diseased area limited to the right upper lobe, is clearly illustrated in the stereo-roentgenogram of Case 7. The heart and ascending aorta are drawn up so far that the arc of the arch is increased and the separation from the decending aorta is so great that one can see through the arch. The right lower lobe is evidently emphysematous and presents upon its lower surface a dome-like protrusion of the diaphragm, evidently due to a localized adhesion of the pleura. The left lung shows no compensatory emphysema, but lines of infiltration and foci of tuberculous disease can be seen scattered through it, especially on stereoscopic examination.

The displacement of the heart and aorta in Case 8 gave rise to symptoms which led the laryngologist to suspect the presence of an aneurysm in an evidently tuberculous subject. In addition to a paralysis of the left vocal cord the case pre-

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sented other very interesting features, and has been reported in detail by Dr. E. L. VanZant, by whom it was referred for Roentgen examination. The Roentgen plates showed that no aneurysm was present but that the heart and aorta had been displaced far to the right. The tuberculous lesion was confined chiefly to the right upper and middle lobes, where consolidation, fibrosis and cavity formation had taken place.

The multiple lesions of a rapid tuberculous process, as well as a moderate displacement of the heart and aorta to the right, are shown in Case 9. Here we have infiltration, consolidation, fibrosis, an old walled cavity, the breaking down of tissue to form a cavity, a cavity in the left upper lobe without a thickened wall, and an area of the lower right lobe covered by thickened pleura.

The remaining cases are illustrations of displacements to the right of the heart or heart and aorta, and are the types of cases readily recognized and termed dextra-cardia. Displacement of the aorta to the right is also present, but had not been determined by the physical examination, while Case 12 is the only case in the entire series in which displacement of the aorta did not occur with the displacement of the heart.

The moderate displacement of the heart and aorta to the right in Case 10 can be accounted for by the adhesion of the pericardium to the diaphragm and the general fibrosis which has accompanied the miliary tuberculosis.

The small masses of miliary tubercle are seen distinctly, especially in the original negative and the lantern slide, scattered throughout both lungs accompanied by bands of infiltration. The upper right lobe is consolidated, with fibroid change and cavity formation.

The wide displacement due to consolidation of the entire right lung with fibroid contraction and emphysema of the left lung is illustrated by Case 11. The original seat of the disease is shown by the advanced fibroid change in the right apex and the cavity formation. The heart and aorta are drawn far over to the right and slightly upward. The spread of the disease to the left lung is seen in infiltration and early cavity formation in the left upper lobe.

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Another illustration of dextra-cardia with advanced fibroid change is shown in Case 12. The apex of the heart is displaced nearly to the median line. In this case, however, we find the arch of the aorta in its normal position. This absence of displacement is probably due to the general fibrosis which is evident throughout both lungs and the absence of consolidation and extensive fibrosis of the right upper lobe. This is the only case where the aorta was not displaced and also the only one of displacement to the right in which the right upper lobe was not extensively involved by the disease.

In all the cases illustrating this paper, and in the entire series from which they are taken, the clinical findings have been compared with the Roentgen diagnosis, and the points brought out alone by the Roentgen examination have been subsequently confirmed by a physical examination.

The Roentgen method of examination has been shown to add to the knowledge obtained by other methods of physical diagnosis, by detecting superficial areas of pneumo-thorax, by showing that the aorta is generally displaced with the heart and by making evident the effect of fibroid change in displacing the viscera through its contraction. In addition, it is a valuable mechanical method of observing and recording the changes, and displacements produced within the thorax by tuberculous lesions of the lungs. It also assists in the understanding of the processes of repair which take place in the closing and healing of old cavities, while it forms a permanent record for comparison with that obtained in later examinations, thus showing the progress of the disease or of the process of repair. It is self-evident that Roentgenoscopic examinations of the thorax and lungs, that is, the visual examination by means of the Roentgen rays and the fluoroscope, can not afford accurate permanent data such as are secured by the rapid Roentgenogram and particularly the stereoscopic Roentgenogram. There can be no doubt that viewing with the fluoroscope is a cheaper method and that it is less accurate since it gives data that are only visible to the eye of one observer. It possibly affords an advantage in viewing the movements of the diaphragm, but it can not eliminate the effect of motion

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produced by the heart's beat and does not show the minute detail essential to a careful diagnosis. An examination sufficiently long to enable the observer to gain any valuable information must necessarily expose the patient to the rays for a far greater period than the second or two required for the rapid stereo-roentgenogram.

The series of cases illustrating this paper in tracings, stereo-roentgenograms and lantern slides shows the contribution which Roentgenology has made to the knowledge of the pathological displacements of the thoracic viscera produced by the lesions of pulmonary tuberculosis.

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THE CONTROL OF FRACTURE WORK BY THE ROENTGEN RAY.

BY ROLAND HAMMOND, M. D., PROVIDENCE, R. I.
Assistant Orthopedic Surgeon to Rhode Island Hospital and St. Joseph's Hospital.

It was only a few years ago that a major part of the Roentgenologist's practice consisted in making plates of fractured bones, and even today, with the marked advance of Roentgenology into the special branches of medicine, I imagine much of the routine work of this specialty consists in determining if a bone has been broken, and if so, whether or not the fragments are in proper alignment.

Up to the time of Roentgen's discovery, the treatment of fractures had made but little progress for many years, and time-honored methods, hoary with age, were used. The practitioner in blissful ignorance of the actual relations of fragments, made an apparently good reduction of his fracture, only to be confronted in many cases at the end of his treatment with a stiffened painful joint, or a deformity which stared the patients and his friends in the face, to the lasting opprobrium of the medical attendant. If the reduction has been anatomically perfect, the chances are strongly in favor of a good clinical result. Of course, poor results are occasionally obtained with the best treatment, but they are becoming less common as better methods of diagnosis and treatment are introduced.

The Roentgen ray has changed much of this. We can now determine accurately just what bones are broken and where; if the reduction has been properly made, and oftentimes if a splinter of bone or bit of soft tissue between the fragments prevents a perfect reduction. All this is done without causing the patient the slightest pain. A large proportion of the medical profession recognize these facts, the intelligent part of the laity are informed on the subject, and the courts are becom-

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ing convinced of the value of the Roentgen procedure. The time is near at hand when no fracture or joint injury will be considered to have been properly treated if a Roentgen examination has not been made. All this is well known to a body of men engaged in this special work, but it is in connection with the value of the Roentgen ray in some of the special points of diagnosis and treatment to which I wish to call your attention. It is a well recognized fact that a Roentgen plate should be taken after an attempt at reduction has been made, to see if the desired result has been obtained. Of almost equal importance is a plate beforehand to know accurately with what condition we have to deal—a fact not appreciated by the profession at large. With the knowledge thus obtained, the reduction can often be easily made, and with but slight trauma to the parts. We see just what mechanical force or leverage is necessary, and how to apply it to the best advantage to accomplish the reduction, and without injuring neighboring structures. It is surprising to see the slight force necessary in many cases to reduce a Colles' fracture when we know the exact relation of the fragments beforehand.

In the routine treatment of fractures, I take plates in two planes, and while they are being developed, fit splints to the limb, prepare dressings, and have everything in readiness. Ether is then administered, and reduction is attempted with the plate at hand for reference. If the reduction seems to have been accomplished, the splints are applied temporarily, and another plate taken and developed with the patient still under ether. If the plate shows that the reduction has been satisfactorily accomplished, the splints are more carefully applied and the patient allowed to recover from the anesthetic. If the reduction is not perfect, another attempt is made, and another plate taken and developed, and so on, until the reduction is accomplished, or it is proved that the fracture is irreducible. This procedure occupies from a half hour to an hour at most, and is more satisfactory and much safer than frequent fluoroscopic examinations. The finer relations of the fragments are often missed when the fluoroscope is used, and besides with the plate we have an indisputable record of suc-

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cess or failure. The only drawback is the time consumed, but with well-timed exposures, rapid plates and strong developers the time is shortened, though at the expense of a beautiful negative. One can oftentimes determine if the fracture has been reduced while the plate is developing, but I have found it safer to wait until the plate is in the fixing bath, before making an absolute judgment.

There is a fairly numerous class of cases in which the fragments can not be held in position by the usual splints, and two courses are open to the surgeon: (1) He can operate and replace the fragments, holding them in position by animal suture, wire or bone plates, or (2) they can be held in place by some external device, usually by extension and counter-extension. In many cases it is absolutely necessary to operate and restore the fragments to their proper position. If the fragments lock together well, no suture or plate is necessary. Oftentimes they can be held by animal suture, which is readily absorbed, and forms an ideal suture material if one must be used. Rarely is it necessary to use bone plates. Mr. Arbuthnot Lane has given a great impetus to bone plating by his remarkable success in these cases. Many cases are plated, however, which I believe could be as well treated by extension and counter-extension, and with greater safety to the patient, if the same thought and energy were used as is employed in operative procedures. We must consider the poor resistance of bones and joints to infection, and the tendency of the wire or plate to act as a foreign body and be extruded before we expose our patients to the risk of suppuration or joint stiffening, or leave a foreign body in the tissues. Most patients prefer not to be operated upon, if as good results can be obtained without taking that risk. These results can be obtained in a large number of cases if the patient will go to bed for two weeks—not much longer than the average operative case is confined.

I have recently treated several cases of transverse fracture of the lower end of the humerus, which could not be held in place by the usual ambulatory splints, or at any angle of flexion or extension of the arm. These were all held by means of extension and counter-extension, and good results obtained.

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They may serve as examples of this method of treatment in other parts of the body. It is based on the work of Bardenheuer and Graessner who have described their method fully in "Die Technik der Extensionsverbände." The details of this treatment have been further elaborated by my associate, Dr. Frank E. Peckham, to whom I am indebted for much assistance. The patient is put to bed on a Bradford frame with the upper arm in abduction at a right angle to the body, the forearm being held vertically by weight and pulley over the bed. The upper arm is strapped down to a board running beneath the Bradford frame, so that the arm can not be pulled up by the weight on the forearm. Traction is exerted on the arm by a band passing around the forearm just below the elbow, which is attached to a weight passing over the side of the bed. A strap around the chest and axilla with weight passing over the opposite side of the bed gives the counter-extension. When the apparatus has been adjusted for a day to allow for the effect of constant traction on the fragments, the patient is taken to the Roentgen laboratory in bed and plates made without disturbing the apparatus. In many cases it will be found that the constant pull has reduced the fragment, or ether may have to be given to place the fragment in proper position, after which it is held by the apparatus. In one case too much weight was used, and the fragment was drawn away from the shaft. Removing a couple of pounds' weight allowed the fragment to slip back into its proper relation. Here the Roentgen ray is an infallible guide to the proper adjustment of the fragments, which can thus be made with precision.

Since callus formation does not begin until about the end of the second week, and union is usually firm before the end of four weeks, it is not necessary to put the patient to bed until nearly two weeks after the date of the fracture. Union will ordinarily be firm enough for the patient to be up and free from apparatus by the end of three and a half weeks. Thus we have attained all that could have been accomplished by an open operation, and with none of its attendant risks.

Two cases will illustrate the value of this method:

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Case 1—Girl, aged four. Transverse fracture of lower end of humerus one inch above epiphysis. Seen on fifth day after injury, when fracture was reduced under ether, and arm put in acute flexion. Plate showed fragment in position. On seventeenth day plate showed that fragment had slipped out of position. Under ether on the next day it was again put in place as proved by a Roentgen plate. On the twenty-second day a plate showed that the fragment had again slipped. Put to bed the same day with extension and counter-extension. Plate on the twenty-fourth day showed the fragment held in position by the apparatus. Allowed up on the thirty-fourth day with the fragment still in position as proved by the Roentgen plate. The elbow was baked in the hot air oven, and passive movements begun. A month later there was a perfect anatomical and functional result.

Case 2—Boy, aged eight. Transverse fracture of lower end of humerus one inch above the epiphysis. There was marked induration and swelling around the elbow, and the anterior surface of the arm and forearm were covered with blebs, whch prevented treatment by flexion. An attempt was made to hold the arm at right angle by an external angular splint. Though the fragment was reduced it could not be held in place in the right-angled position. The arm was treated for a few days by the family physician until the blebs had disappeared, when the patient was put to bed with extension and counter-extension on the ninth day. A plate the next day showed the fragment much improved in position, but not perfectly reduced. Under ether on the thirteenth day the fragment was easily reduced as proved by the Roentgen plate a day later. Apparatus removed on the twenty-eighth day. The fragment was in perfect position, but induration around elbow still marked. Baking and passive movements begun. Case still under treatment, but marked improvement has been made in motion, and the function ought to be good.

Another difficult class of cases to handle is that involving both bones of the forearm. Here the problem of two broken bones, with four ends lying in as many different positions, taxes the skill and patience of the surgeon to the utmost. In

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setting one bone the fragments of the second bone may be forced out of place, and in attempting to remedy this, the fragments of the first bone, which have just been reduced, may be again disarranged. Many times it is impossible to make a proper reduction without an open operation. Here again without the Roentgen ray we are helplessly working in the dark. The same method is used as with the previous class of cases, except that I have never found it necessary to put the patient to bed. At times an intermediate plate, taken after one or two unsuccessful attempts at reduction have been made, will give the clue to the situation, and by applying force in the manner indicated by the plate, the bone will slip back into position.

Again two cases will illustrate the method used:

Case 3—Boy, aged eleven. Fracture of radius and ulna 1½ inches above the wrist in each bone. Reduction attempted unsuccessfully by another physician. Seen in consultation eight days later. Ether given and first attempt at reduction unsuccessful as to the ulna though the radius was put in fairly good position. The appearance of the plate made after this attempt led me to believe that mechanical force applied in a certain direction might effect the reduction. This was done and the subsequent plate showed the reduction satisfactorily accomplished. Case still under treatment, but as the wrist joint is not involved, I see no reason why we may not expect a good result.

Case 4—Boy, aged eight. Fracture of radius and ulna about 1½ inches above the wrist in each bone. Reduction attempted twice under ether by a physician of whose skill in fracture work I have the highest opinion. In this case, guided by reference to Roentgen plates, I was able after two attempts to accomplish the reduction, which though not perfect, is satisfactory in a child with growing bones.

We have found in several cases, that reductions in children which seemed unsatisfactory from a Roentgenologic point of view, have shown perfect anatomical and functional results when plates were made a year later. As the bone

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grows a new medullary cavity is formed, and the bone becomes perfectly straight, usually showing no trace of ever having been fractured.

CONCLUSIONS.

The Roentgen ray, properly used, is an infallible control of fracture work.

Plates after reduction are an absolute necessity.

Plates before reduction are of great value in diagnosing the exact condition and in facilitating reduction.

Many cases now subjected to open operation and plating could be treated by extension and counter-extension after the method of Bardenheuer and Graessner with as good anatomical and functional results, and at less risk and greater comfort to the patient.

In many cases which seem irreducible, plates made while the patient is under ether and after successive attempts at reduction have been made, will often give the clue to the situation, enabling the reduction to be made without resorting to an open operation.

Some fractures are irreducible by the above methods and an open operation is necessary. In these cases an absorbable suture material should be used if possible, reserving wire and plates for cases in which the fragments can be held by no other means.

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SYPHILITIC MANIFESTATIONS IN THE LUNGS, RESEMBLING PULMONARY TUBERCULOSIS WITH REPORT OF CASES.

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During the last three years, in examining about one hundred and fifty cases for pulmonary tuberculosis and studying the condition of the lungs with the help of the Roentgenograph, we found most of the cases to be uncomplicated tuberculosis; a few were mixed infections of tuberculosis and syphilis, while eight cases were seen in which the lung changes were due to syphilis, and which might easily have been mistaken for a pulmonary tuberculosis.

These eight cases consulted a physician because they were losing weight, running a slight temperature, some had a little dry cough; all were easily fatigued; and they or members of their families suspected beginning consumption.

These cases are reported because they suggest that a syphilitic condition occurs more frequently in the lung than is usually suspected, and because they may closely resemble the early stages of pulmonary tuberculosis. In all the cases tuberculosis has been eliminated, first, by no reaction to 12 mg. of Koch's old tuberculin given hypodermically, and, second, by no signs of tuberculosis demonstrable in the Roentgenographs. Moreover, syphilitic infection has been proved either by a direct history of infection, or by a history of miscarriages with other syphilitic signs and symptoms, and in one case by the Wasserman reaction.

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REPORT OF CASES.

CASE NO. I.—Male, age twenty-one years. C. F. B.

A. Reason for coming to physician.—Sent by father who feared patient was beginning to have consumption.

B. History.—Young man, single, clerk. Usual weight 175 to 180 pounds. Lost about 10 pounds during last four months. Has coughed for two months with some expectoration. Chills easily. Family history good, personal history negative, except as stated later.

C. Examination.—Percussion of lungs showed slight relative dullness in the upper part of right lung both before and behind; vocal fremitus increased over the same area. Crepitant and subcrepitant rales over both lungs. The apex of the heart was in the fifth intercostal space in the nipple line; soft mitral systolic murmur. Systolic blood pressure 105 m. m. of mercury by Stanton manometer. Hemoglobin 80% (Dare). Red blood cells, 4,640,000. Faint traces of albumin in urine, no casts. Slight rise in temperature every afternoon up to 99.5 F. Pulse slightly accelerated.

D. Proof of no tuberculous infection.—Did not react to 12 mg. of Koch's old tuberculin given hypodermically. Showed no tuberculous lesions, old or recent, in chest by Roentgenograph. Symptoms cleared up rapidly under anti-syphilitic treatment.

E. Proof of syphilitic infection.—History of infection and chancre nine months before. This history was not obtained at first as patient did not wish his father to know of the trouble.

F. Roentgenographic findings.—Heart enlarged, position is normal. On the right side the diaphragm curve is normal. On the left side the diaphragm is obscured by an increase in density of the base of the left lung, probably due to edema. Glands in hilus of lungs diffusely enlarged, but do not present any typical, discrete, caseated, nor calcified nodes, diagnostic of tuberculosis. Normal markings of lungs exaggerated. Gumma of the right clavicle near the sternal junction. No tuberculous infiltration extending along the peri-bronchial lymphatics toward the apices or lung borders.

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G. Remarks.—There were no signs of syphilis on examination except those in the lungs. The patient had been on mercury intermittently. He was put upon heavy anti-syphilitic treatment and made an excellent and rapid recovery.

CASE NO. II.—Man, aged twenty-eight years. C. C. W.

A. Reason for coming to physician.—Sent by family who feared he had consumption.

B. History.—Young man, single, engaged in office work. Weight three years ago 149 pounds; weight one year ago 135 pounds; weight at present 125 pounds. Slight catarrh in head, coughing for seven weeks, no expectoration. Chills easily. Family history good; personal history negative except as stated later.

C. Examination.—Percussion of lungs showed very slight relative dullness over right apex in front. Crepitant rales over both lungs both in front and behind. Excursion of diaphragm normal. Heart normal with the exception that the first sound was soft and not definite. Ulcer on posterior nasal pharynx. Urine negative. Elevation of temperature up to 100 and 100.5 F. every afternoon. Pulse rapid, 100 to 110.

D. Proof of no tuberculous infection.—Did not react to 12 mg. of Koch's old tuberculin given hypodermically. Showed no tuberculous lesions by Roentgenograph. Condition cleared up rapidly on anti-syphilitic treatment.

E. Proof of syphilitic infection.—History of infection two years and three months before. This information was not obtained at first examination as some of the family were present and patient would not tell it.

F. Roentgenographic findings.—Heart small and vertical, as frequently seen in tuberculosis. On right, adhesions between diaphragm and pericardium. Lung changes not marked, but normal markings exaggerated for this age (twenty-eight years.) No evidences of tuberculous infiltration.

G. Remarks.—Patient was put on suitable anti-syphilitic treatment and his symptoms quickly cleared up. There were no signs of syphilis except the ulcer in the pharynx, and the lung condition.

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CASE NO. III.—Man, aged thirty-nine years. M. N. T.

A. Reason for coming to physician.—He was "running down," had no energy, looked badly, and was losing weight. Knew he had had syphilis, but did not believe his present symptoms were due to this, as he had taken a few weeks' cure at Hot Springs and had been told that the disease had been "boiled out." Thought he might have tuberculosis.

B. History.—Losing weight, night sweats, easily fatigued for last few weeks. Had elevation of temperature after exercise. Family history good; personal history negative except as stated.

C. Examination.—On percussion, slight relative dullness in upper third of right lung. Crepitant rales over both lungs in front and behind. Excursion of diaphragm good. Apex of heart in fifth intercostal space in nipple line. Heart dullness extended a little to right of sternum. Soft mitral systolic murmur. Hemoglobin 84% (Dare). Red blood cells, 4,560,000. Systolic blood pressure 95 m. m. Hg. by Stanton. Slight traces of albumin in urine, a few granular casts. Rise in temperature each afternoon. Pulse soft, regular, accelerated.

D. Proof of no tuberculous infection.—Did not react to 12 mg. of Koch's old tuberculin given hypodermically. Roentgenograph showed no tuberculous lesions in lungs.

E. Proof of syphilitic infection.—History of infection twelve years before.

F. Roentgenographic findings.—Heart enlarged. Adhesion of inner border of diaphragm to pericardium. Some increase of density along the larger vessels and bronchi. No lesions characteristic of an old tuberculosis nor any evidence of a new tuberculous infiltration from the peri-bronchial glands. *Roentgenograph of the lungs obtained post mortem did not show the slightest evidence of any tuberculous condition.*

G. Remarks.—Patient did not do well on anti-syphilitic treatment. During the last month he developed an acute nephritis on top of his former kidney irritation. Patient grew slowly worse, but was up and around to within a few weeks of his death, which occurred four months after first examination and which was due primarily to a myocarditis.

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H. Postmortem report.—Autospy done two hours after death. Lungs were found to be free from pleural adhesions and normal in every respect. Heart showed dilatation, with very little hypertrophy. Fine fibrous threads bound the heart to the pericardium everywhere. The muscle was very soft and flabby, the heart falling over the hand when held up by the apex. The valves did not show vegetations nor atheroma; the aortic valve held water. The aorta showed plaques of beginning atheroma. Coronary arteries showed some hardening. Signs of a chronic pericarditis and myocarditis were well marked, but there were very few signs of an old endocarditis. The kidneys were larger than normal, hard, firm and swollen. The liver was somewhat larger than normal, its surface marked with small pittings like the skin of an orange. Microscopical sections of the liver and kidneys showed increase in connective tissue. In other respects the post-mortem was negative.

CASE NO. IV.—Woman, age twenty-eight years. C. M.

A. Reason for coming to physician.—Not feeling well, losing weight, pain in chest, some cough, no expectoration.

B. History.—Woman, age twenty-eight, had been married, seamstress. Weight one year ago 135, weight now 108 pounds. Right breast had been removed two years before for carcinoma, no recurrence. Usually well and able to work. Had pleurisy pains in left chest, tenderness along some of the ribs, occasionally had a little fever. Menstruation irregular.

C. Examination.—On percussion, relative dullness over upper third of right lung, both in front and behind. Subcrepitant rales more or less all over both lungs. Friction sounds to left of heart in left axillary line. Excursion of diaphragm good. First sound of heart soft and not well defined. Heart not enlarged. Urine negative. Temperature ranged from 97° to 99° F. Pulse somewhat accelerated.

D. Proof of no tuberculous infection.—Did not react to 12 mg. of Koch's old tuberculin, Roentgenograph showed no indication of tuberculosis. Trouble cleared up on potassium iodide and mercury.

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E. Proof of syphilitic infection.—History of infection two years before, with treatment intermittently. Gave a positive Wasserman reaction.

F. Roentgenographic findings.—Heart slightly smaller than normal. Some increase in lung density, most marked at hilus. Normal markings much exaggerated for her age. The apparent difference in density of the two sides is due to the fact that one breast has been removed for carcinoma. Gumma of left clavicle at the inner third which had to be differentiated from metastatic carcinoma. No evidences of tuberculosis.

G. Remarks.—Pleurisy improved greatly and general condition became much better when put on mercury and potassium iodide. Patient still under treatment and improving.

CASE NO. V.—Woman, age thirty-seven years. B. C. W.

A. Reason for coming to physician.—Indigestion, losing weight, running a temperature, cough and expectoration, generally "worn out."

B. History.—Woman, married, age thirty-seven. Usual weight 135, weight one year ago 100, weight now 87 pounds. Has cough with expectoration, vomits on account of cough. Appetite fair, has some constipation. Menstruation regular, flows four days. Has had three children living and three miscarriages. Severe "rheumatic" pains in legs.

C. Examination.—On percussion, upper half of right lung relatively dull, vocal fremitus increased, moist, crepitant, and subcrepitant rales. In the left lung, crepitant rales, old thickened pleura. Heart negative; urine negative. Temperature runs up to 99.5° nearly every day. Repeated examinations of sputum showed no tubercle bacilli. Lymphatic glands everywhere enlarged. Liver enlarged. Pupillary reflex gone, patellar reflex gone. Examination of eye showed beginning optic atrophy.

D. Proof of no tuberculous infection.—Did not react to Koch's old tuberculin. Roentgenograph showed no signs of tubculosis in lungs. Improved promptly on potassium iodide and mercury.

E. Proof of syphilitic infection.—No direct history of infection could be obtained, but patient had had three miscarriages, had no patellar reflex, no eye reflexes, optic atrophy, and suddenly,

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while under treatment, had a paralysis of the muscles of the left eye. Patient stood large doses of potassium iodide, 180 grains per day for three months. Rheumatic pains left and patient gained in weight.

F. Roentgenographic findings.—Heart normal in size. Calcification of cartilage of first rib. Increased density of lower right lung. No evidences of old tuberculous lesions. Apices clear.

G. Remarks.—Lung condition has cleared up. Patient seems to be developing tabes dorsalis.

CASE NO. VI.—Woman, age thirty-four years. L. C.

A. Reason for coming to physician.—Cough, suddenly became cross-eyed. Some expectoration.

B. History.—Woman, age thirty-four, married fifteen years. Has had slight loss in weight, during last year. Is very nervous. has cough with expectoration. Six weeks before examination suddenly developed paralysis of external oblique muscle of left eye. Has "rheumatic" pains in legs and "all over." Has had cystitis badly. History of sores on labia years ago. History of many miscarriages.

C. Examination—On percussion, both apices dull, vocal fremitus increased on right side. Rales over both lungs, large and moist on left side. Heart negative; urine negative. Elevation of temperature each afternoon.

D. Proof of no tuberculous infection.—Did not react to 12 mg. of Koch's old tuberculin. Rapid improvement on anti-syphilitic treatment.

E. Proof of syphilitic infection.—History of pregnancies: 1894, miscarriage at 7 months. 1895, child born at term, died at 7 weeks. 1896, child born at term, living. 1898, child born at term, living. Since then has had twelve consecutive miscarriages.

F. Remarks.—Is well after continued anti-syphilitic treatment.

CASE NO. VII.—Young man, age twenty-one years. H. A. E.

A. Reason for coming to physician.—Losing weight, coughed, had expectoration each morning. Told by his physician that he had consumption.

B. History.—Male, twenty-one years, unmarried, office work, weighed one year ago 145 lbs. This is the heaviest he had ever

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been. Weighed on first examination 133 lbs. Was getting pale, losing strength, had a cough with some expectoration on rising in the morning. He had been to one of the very best sanitariums and health resorts in this country where he was told that he did not have tuberculosis, but the true cause of his complaint was not told him. He was referred back to his family physician, who had sent him away with a diagnosis of pulmonary tuberculosis. Knowing that something was wrong with him, the sanitarium physician telling him he did not have tuberculosis and his family physician telling him he did, he came to us for examination and a diagnosis, sent by one of our old patients.

C. Examination.—Slight relative dullness over upper half of right lung in front and behind. Vocal fremitus increased behind, and in supraclavicular space in front. Crepitant rales over both lungs and sub-crepitant over right lung upper half. Excursion of diaphragm normal. Heart enlarged. Apex in fifth intercostal space, one-half inch outside nipple line, first sound of the heart soft and blowing. Blood pressure 120 M. M. mercury Stanton manometer. Temperature 97.4 at 9 A. M. Later the temperature range was found over two weeks to be from 97° to 98.6°. Pulse 92, soft. Haemoglobin 90% (Dare.) Cervical lymphatics enlarged, especially those under the chin and in front of the neck. Trace of albumin in urine. No casts.

D. Proof of no tuberculous infection.—Repeated examinations of sputum showed no tubercle bacilli. Did not react to 12 mg. Koch's old tuberculin in one dose.

E. Proof of syphilitic infection.—History of chancre on lip 2½ years before, known to have been received from a kiss. Patient did not try to conceal this infection, but did not think of it in connection with his present trouble.

F. Roentgenographic findings.—Heart enlarged. Diaphragm normal. Marked ossification in first costal cartilage. No marked increase in density of hilus shadows. No old calcified lesions of tuberculosis. No evidence of a new tuberculous infiltration.

G. Remarks.—Patient has now been under our treatment with heavy doses of mercury for a year and a half. Has long been symptomatically well. In six months he reached 150 lbs., a gain of 17 lbs., and more than he had ever weighed before.

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CASE NO. VIII.—Man, age twenty-one. F. H.

A. Reason for coming to physician.—Coughed, felt very badly, weak, could not work.

B. History.—Patient thought he had consumption and presented himself at the Thalian Tuberculosis Dispensary for examination. He had cough, expectoration, fever, sweats, chills easily, lost 12 lbs. in 6 months, appetite poor, no gastric disturbances.

C. Examination.—Relative dullness right supra-clavicular region. Sub-crepitant, crepitant and moist rales over lungs. Heart negative. Chest of long narrow type. Further examination negative.

D. Proof of no tuberculous infection.—No bacilli in sputum. No reaction to 12 mg. Koch's old tuberculin given at one injection.

E. Proof of syphilitic infection.—History of syphilitic infection one year before.

F. Roentgenographic findings.—Increased density of hilus shadows apparently due to diffuse enlargement of glands, otherwise normal.

G. Remarks.—Patient has been under active anti-syphilitic treatment for nine months—is to all appearance well, has been working for several months. The only danger is that he feels so well he will not continue his mercury as long as is advisable.

CONCLUSIONS.

First, that during the secondary stage of syphilis, and even after gumma formation has begun, there may be a catarrhal bronchitis which closely resembles beginning tuberculosis, but which can be rapidly cured by anti-syphilitic treatment.

Second, that the catarrhal signs are general over both lungs and not localized, nor limited to the apices.

Third, that accompanying this catarrh there may be cough and expectoration, moderate elevation of temperature, emaciation, night sweats, loss of strength, and general debility, all of which symptoms resemble pulmonary tuberculosis, but which clear up rapidly upon the administration of mercury; much faster than a tuberculous process could under any treatment.

Fourth, it seems probable that, where cases of pulmonary tuberculosis treated with mercury and potassium iodide have

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shown great and rapid improvement, the condition has been one of syphilis or of syphilis and tuberculosis combined.

Fifth, from the study of these cases we believe that a syphilitic condition of the lungs occurs more frequently than is usually suspected and that, without doubt, it is often treated for pulmonary tuberculosis.

Sixth, all our cases have shown a relatively low blood pressure.

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COLLABORATION ESSENTIAL IN THE DIAGNOSIS OF SURGICAL CONDITIONS OF THE KIDNEY AND URETER.

BY JOHN HUNTER SELBY

It may be stated safely that few Röntgenologists have escaped the grave situation in which an erroneous interpretation of an X-ray plate has been responsible for operative procedures and the surgeon demands a postoperative or perhaps postmortem explanation. In such an event it is comforting to be able to prove that the error was unavoidable, and not the result of inaccurate technic. All Röntgenologists of experience have, at times, interpreted plates incorrectly, and only with the utmost care and earnest endeavor do they avoid errors in most cases. However, with improved technic, and a closer cooperation with their fellow practitioners, the percentage of failures should be reduced to a minimum.

In no branch of X-ray work are there greater opportunities to work out refinements in differential diagnosis, of such vital importance to patient and surgeon than in the field of surgical diagnosis of the urinary tract. The urgent need for a more complete and systematic Röntgen examination of the kidney and ureter cases, than that which is afforded by the work of novices should be realized by all specialists as well as by general practitioners. Physicians are too often called upon to deal with inaccuracies in Röntgenographic work, and many of them show unusual patience in their toleration of unsatisfactory and, frequently, misleading examination.

In explanation of the present unsatisfactory and inaccurate condition of much of this work, one should consider (1) the comparative newness and rapid development of this branch of X-ray work; (2) insufficiency of clinical material, proper equipment, and detailed technical information, and opportu-

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nity for systematic instruction; (3) the failure of the physician to anticipate the necessity for an adequate initial outfit, and the cost of its installation and maintenance; (4) the presence within the field of Röntgenology of so many amateurs and transients whose experience in the interpretation of plates is insufficient.

We have a right to regard with suspicion all diagnoses based on data known to have been obtained under such conditions.

The methods commonly employed by the inexperienced X-ray worker in the diagnosis of genito-urinary conditions are about as follows: A cathartic may or may not be given the day before. One or more exposures of the abdomen and the pelvis are made. The plates commonly used are slow, and the exposure prolonged. Shadows of various kinds are frequently met with, and, depending largely upon whether a given shadow is in the line of the ureter or in the region of the kidney, a "snapshot" diagnosis is made. The second examination is rarely deemed necessary to confirm the first, and a cystoscope is seldom employed to "check-up" the findings. Such procedures must necessarily result in inaccurate interpretations, since it is very difficult to identify many of the suspicious shadows which appear in most plates of the bony pelvis.

I will not here name the various objects capable of casting shadows, which must be ruled out. In some instances the passing of a stylet, particularly where a clear set of stereoscopic plates can be obtained immediately, will aid us materially in localizing a shadow. But, as has been emphasized by Braasch, the stylet alone does not always localize a given shadow. A small calculus in a ureteral diverticulum is one instance where it might fail. Again, a phlebolith may lie so near to the ureter, or a calcareous deposit in the wall of the ureter may occupy a position so close to the stylet as to make it impossible to be positive of its exact location or nature. We have encountered this condition many times, and in several instances, at operation, have witnessed the practical demonstration of our errors in interpretation. These failures should

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stimulate us to renewed effort to work up a more accurate technic.

Phleboliths occur either singly, in strings, in groups, sometimes unilaterally placed, or on both sides in the bony pelvis. Their distribution is irregular in many instances. They not infrequently occur in conjunction with ureteral calculi from which their shadows alone are indistinguishable. In appearance they vary so widely that recognition and identification are often attained with the greatest difficulty, particularly in those cases where the shadows occur upon the side where we strongly suspect trouble. Here again it is absolutely necessary to remove all possible doubt and make every effort to be positive in our findings. For example, we should not be content to say of a given "suspicious" shadow, "It is most likely a phlebolith, but it happens to be situated on the side where we expect a ureteral calculus." In over half of the cases that are referred to our laboratory for examination phleboliths give more trouble than any other three groups of objects that necessitate "proving up."

There is, however, a method of examination at our command by which we can clear up all doubt in at least 95 per cent of these cases. The first essential in this method and its success depends on absolute co-operation between the cystoscopist and the Röntgenologist. Each specialist has his separate and distinct work to perform. It is manifest, therefore, that at the outset a combined technic must be carefully worked out by the two examiners so that the various details may be employed in harmony.

This co-operative examination opens up additional possibilities, especially in that large group of abdominal cases seen in daily practice, which exhibit an indefinite line of symptoms referrable perhaps to the appendix, gall-bladder, stomach, duodenum or spine, but with a strong possibility of involvement of the genito-urinary tract. Such cases require careful study, and some of them tax every means at our command before we can approach an accurate diagnosis.

In St. Mary's Hospital (Mayo Clinic) all such cases are referred to the Röntgen laboratories for examination. The

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routine examination in this clinic is as follows: The clinician in charge takes a full history and makes a physical examination. A 24-hour specimen of urine is analyzed and perhaps a gastric analysis made. These may throw considerable light on the case and yet not fix the diagnosis. The case is then referred to the Röntgen Laboratory after the proper preparation of the intestinal tract. A set of stereoscopic plates of the upper abdomen, and a second set of the lower abdomen and pelvis are made by the rapid method, that is, while the breath is held. Rapid plates (10x12) are used routinely. The exposures range from a fraction of a second to, in rare cases, three seconds. Intensifying screens are seldom needed. Should this examination fail to reveal any abnormality of the genito-urinary tract the diagnosis is still in doubt. The patient, therefore, goes through a second preparation of the intestinal tract and is referred to the cystoscopist the following day. In the meantime, the original plates are studied and a consultation is held between the physician in charge, the Röntgenologist and the cystoscopist. This, at times, furnishes the cystoscopist with much needed information, and establishes a new working basis for the Röntgenologist, should subsequent events indicate a second X-ray examination. The cystoscopist now makes his thorough routine examination. This alone may clear up the diagnosis and thus eliminate the necessity for the "combined examination." It may confirm the original X-ray findings or disprove them. Again, it may give evidence of trouble not heretofore suspected. Therefore the indications for the combined examination depend upon the *original X-ray findings* plus the findings at the cystoscopic examination.

At this stage in the examination the procedure must vary with the individual case. Voelcker in 1906, demonstrated that a solution of silver colloid (collargol) injected through the ureteral catheter would produce a shadow outline of the renal pelvis on the X-ray plate. He demonstrated several cases of hydronephrosis and suggested further possibilities of the method in renal diagnosis. Early in 1909 Braasch applied the method in this clinic. Since then it has been used here in over 600 cases and its value amply proven in the diagnosis of num-

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erous pathologic conditions of the urinary tract. Silver colloid solution possesses a relatively high power of absorption for X-rays, as compared with the surrounding tissues. If used while fresh in a strength of not over 10 per cent., an effective diffusion with the urine present avoids precipitation of colloidal silver. The density of the shadow cast depends upon several factors: (1) the skill of the operator who makes the injection; (2) the amount injected; (3) the thickness of the overlying tissues and their consistency; (4) the quality of rays in use.

The injection should be done by the cystoscopist, who is familiar with the peculiarities of the case. The patient, being more or less nervous under such circumstances, is apt to look with suspicion on any additional manipulations. The patient must be kept perfectly still and the exposures should be as short as possible in order to secure clearness and density. All of these factors must be taken care of simultaneously. In the hands of a skilled examiner the procedure is usually attended with but little discomfort.

There are two efficient methods of injecting the kidney and ureter with silver colloid: (1) the *gravity* method and (2) the *syringe* method. The important factor in each is to avoid over-distending the renal pelvis, its calyces, and the ureter. Should over-distention occur, a renal colic may cause a violent contraction which prevents getting an outline of the pelvis in repose. The shadow of the pelvis in contraction is misleading and valueless. During the attack of colic the patient is restless and even if the exposure be short we are apt to get a blurred image which is also confusing.

Should, for example, the original plates show a shadow at the region of the uretero-pelvic juncture on the right side,—perhaps shown distinctly in both plates of the stereoscopic set—we should record its presence, appearance, and apparent location, and call it a "suspicious shadow" to be investigated. The case is referred to the cystoscopist for further examination. We do not dare to risk making a diagnosis on the original plates alone, even when the history and symptoms would seem to justify it. Experience in a large number of these

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cases has taught us that the most careful interpretation, in many instances, is unsafe. Therefore, we are content to call these shadows "suspicious" until we have established their identity and their approximate location.

At the subsequent or *combined examination* we seek not only to locate and identify the calculus, if present, but we endeavor to gain additional information, such as demonstrating the possible presence of an associated ureteritis, constriction or local dilatation of the ureter, hydroureter, hydronephrosis, pyonephrosis, or deformities. Should the above procedure exclude the "suspicious shadows" as a possible source of trouble and fail to demonstrate any other deviation from the normal, the genito-urinary tract may be eliminated from the examination. But the combined examination may have demonstrated any one of a number of important surgical conditions; for example, an anatomic or pathologic stricture, kink, constriction, tortuosity, an anomaly of the ureter, nephroptosis, pyonephrosis, hydronephrosis, tuberculosis or chronically inflamed renal pelvis, variation in the shape and contour of the normal pelves and calyces, the presence of organized or amorphous deposits in the kidney, or a renal neoplasm.

Oftentimes one is called upon to rule out the kidney in the case of an abdominal tumor with which it may easily be confused. Here the combined method of examination is of the greatest value. We cannot only locate the position of the kidney and thereby ascertain the relative position of the tumor, but experience, gained by the study of a large number of plates outlining the renal pelves has shown that where the kidney itself is involved to any extent by a tumor one can usually find distinct evidences of it in a clear X-ray plate of a skillfully injected renal pelvis.

None of the above mentioned conditions occur so rarely as to be ignored as a possibility in a given case. All of the conditions mentioned above have been demonstrated in this clinic within the past two and one-half years, and some of them many times.

These observations are based upon a study of 1986 abdominal cases of the type referred to above, radiographed during

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the past eighteen months in St. Mary's Hospital (Mayo Clinic). Of these, 300 were examined by the combined method, colloidal silver being used.

References.

Braasch: Surgery, Gynecology & Obstetrics, April, 1911; Annals of Surgery, Apr. and Nov., 1910; Jour. A. M. A., Dec., 1911.
Voelcker: Beit. z. klin. Chir., 1906, lii.

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CONSTITUTION.

As Revised and Adopted by the Society, October, 1910, and with Amendments Added as Adopted September 20 to 23, 1911.

ARTICLE I.

Name.—The Society shall be known as the American Roentgen Ray Society.

ARTICLE II.

Object.—The object of the Society shall be the study and practical application of the Roentgen rays.

ARTICLE III.

Section 1. The Members shall be Active, Corresponding, Honorary and Associate, and shall be persons interested in the object of the Society, recommended by at least two members in writing, and approved by the Executive Committee, who must have proof of their good ethical standing. They shall be elected by ballot.

(*See Resolution* passed by three-fourths vote of the Society, September 23, 1911, prescribing new requirements for the eligibility of all applicants for *active* membership in the Society.)*

Section 2. Active members shall be residents of America, shall sign the Constitution, and pay annual dues of ten dollars ($10.00), which sum shall include the subscription to the AMERICAN QUARTERLY OF ROENTGENOLOGY.

Section 3. No member who is in arrears for annual dues shall vote, hold office, or be entitled to receive the transactions. It shall be the duty of the Treasurer to erase from the roll of membership the name of every member who is in arrears for one year, thirty (30) days after the receipt of a registered letter by said member, such action to be reported at the next annual meeting for confirmation.

Section 4. Corresponding members shall be residents of foreign countries.

Section 5. Honorary members shall be persons who have distinguished themselves in Roentgen ray research or practical work.

*See pages 5 and 6.

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Section 6. Associate members shall be persons who are interested in the advancement of the Roentgen ray, but who are not actively engaged in radiographic or radiotherapeutic work, whose membership is not otherwise provided for. They shall be required to pay annual dues of ten dollars ($10.00), which sum shall include one subscription to the AMERICAN QUARTERLY OF ROENTGENOLOGY.

Section 7. Corresponding, honorary and associate members shall have all the *privileges* of active members, except to vote and hold office.

ARTICLE IV.

Officers. The officers shall be a President, five Vice-Presidents, Secretary, Treasurer, Librarian, an Executive Committee of three and a Board of Censors which shall consist of the three last living ex-Presidents. The officers shall be elected annually by ballot. (See Section 5, Article V.)

ARTICLE V.

DUTIES OF OFFICERS.

Section 1. The President shall perform all the duties pertaining to that office, and shall deliver an address during the annual meeting.

Section 2. In the absence of the President, one of the *Vice-Presidents* shall preside.

Section 3. The Secretary shall keep or cause to be kept, a correct record of all transactions of the Society in a permanent form. He shall send due notice of all meetings to each member, shall notify all members of committees of their appointment and of the duties assigned to them. He shall conduct the correspondence and perform all duties usually pertaining to his office. The Secretary shall have printed an alphabetically arranged list of the members of the Society, with their addresses, for free distribution to members applying for same, which list shall be revised from time to time, and shall specify charter members.

Section 4. The *Treasurer* shall receive and be accountable for all money that shall come into his hands by virtue of his office. He shall give good and sufficient bond to the Executive Committee for the safe keeping and disposal of his trust, and shall make a full report to the Society annually. He shall pay out money only

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by the written approval of the President and Chairman of the Executive Committee.

Section 5. An *Executive Committee* of three members shall be elected as follows: One for three years, one for two years, and one for one year; and thereafter, one annually to serve for three years, the *new member* of the Executive Committee *to be elected by ballot,* the polls to be open at the Registration Bureau for twenty-four hours, and the one receiving the highest vote to be declared elected. They shall hold the bond of the Treasurer, audit his accounts annually, arrange for annual meetings, have general supervision of the affairs of the Society not otherwise provided for, and shall transact the business of the Society.

Section 6. A *Board of Censors,* consisting of the three last living ex-Presidents, the senior of whom shall be Chairman, shall consider all matters pertaining to the conduct of members of the Society, and after due consideration and investigation of complaints, if it appears to be misconduct, they shall communicate with the member in question. Upon a continuation of the misconduct they shall refer the matter to the Society at the next annual meeting for further action.

ARTICLE VI.

Meetings. The annual meeting shall be held on the Wednesday following the second Tuesday of December of each year, unless otherwise arranged by the Executive Committee.

ARTICLE VII.

Publications. A Committee of Publication, consisting of five members, of which the President and Secretary shall be members, shall be elected at each annual meeting. They shall be nominated by the Nominating Committee and elected at the same time as the other officers. The Publication Committee shall appoint the Editor of the AMERICAN QUARTERLY OF ROENTGENOLOGY, and thereafter their power shall cease except in an advisory capacity.

ARTICLE VIII.

Amendments. This Constitution may be amended by a three-fourths vote of all the members present at an annual meeting, provided the proposed amendment has been read before the Society at least one day previously, and the hour for action has been set by the Society and announced in open meeting at least one day previously.

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